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ABSTRACT

Topics addressed by papers in this proceedings include: World Wide Web-based collaborative learning; using Microsoft Outlook Web access to provide e-mail service on public access computers; helping faculty use technology; installing and maintaining an Internet Service Provider; the role of the Web in enhancing learning; current and future trends in information technology; managing deviant behavior in the virtual classroom; preservice teachers' technology attitudes; introducing computer science to non-majors; development of an institution-wide technology/curricular planning process; cyberfluency in the 21st century; virtual reality models in the classroom; technology in teacher education; meta-learning digital library initiative; setting up and administering a computer network; Web management of student information; preparing to be technologically ready for the 21st century; Microsoft tutorials; Microsoft grants; Total Quality Management in the computer lab; e-mail as an official means of communication; updating computer systems; evaluating a "cyberclass"; National Science Foundation grants; videoconferencing; visually taking class attendance with a computer; technical training and support for students; and building a wireless laptop computing lab. This volume also provides information about the Association of Small Computer Users in Education (ASCUE), a list of ASCUE board members, profiles of keynote speakers, descriptions of pre-conference workshops, and a presenters index. (AEF)

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ASSOCIATION OF SMALL COMPUTER USERS IN EDUCATION

"Continuing Second Quarter Century of Service"

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Proceedings of the 1999 ASCUE Summer Conference

32nd Annual Conference
June 13 - 17, 1999

North Myrtle Beach, South Carolina

Edited by Peter Smith, Saint Mary's College

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ASCUE

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32nd Annual conference
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Web: http://www.gettysburg.edu/ascue

ABOUT ASCUE

ASCUE, the Association of Small Computer Users in Education, is a group of people interested in small college computing issues. It is a blend of people from all over the country who use computers in their teaching, academic support, and administrative support functions. Begun in 1968 as CUETUG, The College and University Eleven Thirty User's Group, with an initial membership requirement of sharing at least one piece of software each year with other members, ASCUE has a strong tradition of bringing its members together to pool their resources to help each other. It no longer requires its members to share homegrown softwatre, nor does it have ties to a particular hardware platform. However, ASCUE continues the tradition of sharing through its national conference held every year in June, its conference proceedings, and its newsletter. ASCUE proudly affirms this tradition in its motto "Continuing Second Quarter Century of Service."

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NEED MORE INFORMATION?

Direct questions about the contents of the 1999 Conference to Dagrun Bennett, Program Chair, ASCUE '99, Director of Computing Services, Franklin College, Franklin, IN 46131, 317-738-8150, bennett@franklincoll.edu. Web: http://www.gettysburg.edu/ascue

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ASCUE 1998-1999 Board Members

(years remaining in office including current year)

PRESIDENT
Bill Wilson (1 year)
Academic Computing
Gettysburg College
Gettysburg, PA 17325
717-337-6933
wilson@gettysburg.edu

PAST PRESIDENT
Carl Singer (1 year)
Computer Center
Depauw University
Greencastle, IN 46135
317-658-4294
singer@depauw.edu

PROGRAM CHAIR
Dagrun Bennett (1 year)
Computing Services
Franklin College
Franklin, IN 46131
317-738-8150
bennett@franklincoll.edu

TREASURER
Thomas Pollack (2 years)
School of Business Administration
Duquesne University
706 Rockwell Hall
Pittsburgh, PA 15282
412-396-1639
pollack@duq2.cc.duq.edu

SECRETARY
Tom Gusler (1 year)
103 Carrier Hall
Clarion University
Clarion, PA 16214
814-226-2676
tgusler@mail.clarion.edu

NEWSLETTER EDITOR
Peter Smith (1 year)
Saint Mary's College
Notre Dame, IN 46556
219-284-4493
psmith@saintmarys.edu

LIBRARY/HISTORIAN
Jack Cundiff (1 year)
Horry-Georgetown Technical College
Box 1966
Conway, SC 29526
803-347-3186
cundiffj@.hor.tec.sc.edu

BOARD MEMBER AT LARGE
Rick Rodger (1 year)
Horry-Georgetown Technical College
Box 1966
Conway, SC 29526
803-347-3186
rodger@hor.tec.sc.us

BOARD MEMBER AT LARGE
Nancy Thibeault (2 years)
Miami University Middletown Campus
4200 E. University Blvd.
Middletown, OH 45042
513-727-3355
thibeane@muohio.edu

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Keynote Speakers

Chuck Dziuban has been on the faculty of the University of Central Florida for thirty years. He specializes in measurement and applied multivariate statistics. He is the founding director of the Faculty Center for Teaching and Learning and currently is Principal Investigator of the Distributed Learning Impact Evaluation at UCF. Dziuban has published extensively in the psychometric area and served as a measurement consultant to business and government. In addition to his research with distributed learning, he is currently working on a project dedicated to describing communication patterns of adolescents.

Chuck will give the first keynote address on Monday morning. His topic is "What Do We Know About Learning in Technology-Rich Environments."

Peter Havholm and **Larry Stewart**, both Professors of English at The College of Wooster, have collaborated on the use of computers in the teaching of literature since 1987 and have published a number of papers and book chapters on the subject. They won an EDUCOM/NCRIPTAL Award for Distinguished Curricular Innovation in 1989 and a Sears Award for Innovative Teaching in 1990. Stewart is co-author of A Guide to Literary Criticism and Research (3rd ed., Harcourt Brace Jovanovich, 1996) and has just assumed the Mildred Foss Thompson Chair of English Language and Literature. Havholm recently returned to teaching after fifteen years in administration. He has just published 'Let the Sovereign Speak' in The Journal of Commonwealth and Post-Colonial Studies, Vol. 7, No. 1 (Spring, 1999). Their most recent joint publication is "Computer Modeling and Critical Theory" (Computers and the Humanities, Vol. XXX, 2, 1996). They have presented their work at such conferences as CATH94, NECC, M/MLA, ASCUE, MLA, and ALLC/ACH.

The two speakers above will team up to give the second keynote address on Tuesday morning. Their topic is "The Pedagogy of Extending the Classroom Using Technology"

Pre-conference Workshops

Pre-conference Workshop 1

Campus Partnerships for Teaching Information Literacy

Presented by: Deb Ebster and Pat Farney, Librarians Educational Resources Center, Rock Valley College

This hands-on half-day workshop will introduce faculty to a proven model for implementing an information literacy program into the classroom. Librarians at RVC will demonstrate how partnering with faculty and using a conferencing system they were able to enhance the teaching and learning experience. The process incorporated both print and electronic resources. The model will show how collaborative learning and teaching was used to develop critical thinking and problem solving skills and how this model can be used in partnering with local high schools. Assessment issues and outcome measures will be discussed along with some details of how funding was obtained through a grant to support the program.

About the Presenters: Pat Farney and Deb Ebster are on the faculty at Rock Valley College. As librarians they have led workshops on the internet, electronic resources and information literacy for the faculty, staff and students. Each is a liaison to several academic divisions and has experience developing campus partnerships. They recently completed an LSTA grant introducing information literacy to students in area high schools through a partnership with secondary librarians and teachers.

Pre-Conference Workshop 2
Delivering Dynamic Web Content Through Active Server Pages and Database Technology
Presented by: David R. Adams, Professor of Information Technology, Macon State College

The focus of this hands-on workshop will be about developing data-driven Web sites using server-side scripting and database access methods. These technologies can help transform Web sites from static informational displays to dynamic, interactive pages of timely and personalized content. It can also make it possible for faculty, staff, and students to conveniently create a Web presence. Topics will include the client/server model for Web processing, the Active Server Pages Component model, file processing through the Web, database processing through the Web, delivering documents and materials, and integrating instructional and administrative systems. The pace of the workshop will be geared to the background of the participants. Ideally a background including rudimentary HTML page authoring experience and familiarity with simple programming logic will allow for the best coverage of the topics.

About the Presenter: Dr. David Adams is Professor and Peyton Anderson Endowed Chair of Information Technology at Macon State College. His recent teaching interests have been in the areas of Web development, networking, and multimedia. Dr. Adams has authored eight textbooks in various areas of computers and information technology, was active in establishing national curriulum standards in computer information systems, and has helped develop undergraduate and graduate programs at Arkansas State University, Northern Kentucky University, and Macon State College.

Pre-conference Workshop 3
Tools to Build Your Course Web Site
Presented by: Steve Anderson, University of South Carolina, Sumter, Nancy Thibeault, Miami University of Ohio, Bill Wilson, Gettysburg College

A popular software solution on campus today is a package that lowers the barrier for faculty who want to develop a web presence for their courses. The demand for this software has resulted in a crowded field of contenders. The co-presenters, each engaged in implementing at least one of these tools on their campus, will introduce several of these packages (including WebBoard, Blackboard, Web Course in a Box) and compare and contrast features, including cost, infrastructure needed to support the package, its level of sophistication, for example. During the afternoon participants will have the opportunity to test-drive some of these packages and try their hand at creating material within these environments. The workshop leaders will also be available to discuss administration features and any other issues people would like information about.

About the Presenters: Steve Anderson has been heavily involved in multimedia since 1992, after attending an ASCUE workshop. He has presented many papers at ASCUE and HENA which emphasize multimedia as a tool for teaching/learning as well as for presentation purposes.

Nancy Thibault is the Computer Services Manager and the other Co-Coordinator of the Faculty Summer Institute on Teaching with Technology and annual technology fair at Miami University. Her special area of interest is Web/Database programming.

Bill Wilson has given many internet related workshops at ASCUE which have always been well attended. He has a wealth of experience in this area both from his work at Gettysburg and from several consulting engagements.

Pre-Conference Workshop 4

Extrapolating Success: Supporting and Encouraging Faculty Use of Technology for Teaching,

Carl P. Singer, Professor of Computer Science, Director of Academic Computing, DePauw University, Carol L. Smith, Coordinator of User Services, DePauw University.

Participants in this workshop will acquire ideas that can be used effectively to support faculty who use technology in teaching. The workshop will consist of presentations, discussions and exercises which focus on strategies to support and encourage those faculty. These activities will be based on techniques used at DePauw University under a grant from the Andrew W. Mellon Foundation coupled with ideas generated by participants. Some topics to be addressed will include long-term team projects, walk-in support, encouraging technology challenged faculty, employing students and part-time faculty, support staff development, and the challenge of providing hardware and software resources. Workshop facilitators will include full and part-time support staff (including students and faculty) as well as students and faculty who received that support.

About the Presenters:

Carol Smith has been Coordinator of User Services and Computing Labs at DePauw University for the last four years. She spent six years at Indiana University in user support before coming to DePauw, where she is currently responsible for creating support mechanisms for all students, faculty and staff on cámpus. She is also part of a team which is developing a new faculty instructional support program at DePauw. Carol has presented papers and given tutorials on team-based methods for project management at two previous ASCUE Conferences.

Carl Singer has been Director of Academic Computing and Professor and Chair of Computer Science for many years. Along with regular duties, Carl has been actively involved in promoting effective and appropriate use of technology in teaching and learning. For the past several years Carl has successfully promoted the use of teams for problem solving and process inprovement. He has given workshops and consulted on team-based methods for project management at ASCUE Conferences and elsewhere.

A WWW-Based Collaborative Learning Tool for the Non-Computer Science Faculty Member

Stephen T. Anderson Sr.
University of South Carolina Sumpter
200 Miller Rd.
Sumpter, SC 29150
(803) 775-6341
stevea@sc.edu

Introduction

Virtual classrooms are becoming more common, often as a supplement to existing "traditional" class time as well a "distance education" alternative to class time. Many courses are being offered nearly free of on-campus seat-time requirements. It is obvious that the World Wide Web has spread to households, dorm rooms, and work places to the point that many students are capable of completing all course requirements for many classes virtually without setting foot in the traditional classroom. This paper, however, focuses attention mainly on utilizing web-based collaborative tools as a supplement to the traditional classroom experience. My interests lean towards utilizing the web to increase and enhance communication and performance in the classroom among the students as well as between students and the instructor. One concern was to choose software which was easy enough to implement and maintain so that any faculty member, NOT just the web-intensive, would feel comfortable with the technology. It was paramount that the technology not get in the way of improving the teaching/learning experience for BOTH the student and the teacher.

While it is no doubt true that the web tool(s) utilized is (are) less important than the desired end result of enhancing the teaching/learning experience, this paper will deal with a readily available product which was purchased and implemented at the University of South Carolina Sumter. We will discuss the rationale behind our choice, the experience of installation, and the positive and negative experiences during implementation. We also offer screen captures which demonstrate the most effective uses we have identified for the use of this collaborative learning tool. Lastly, we will identify what we perceive as the next stage of implementation and utilization at our institution.

Choosing the Tool

After attending a conference where many tools were being discussed, we decided that whatever was chosen should not require a knowledge of HTML nor web site construction. Our faculty is approximately 10% web-challenged, 60% web-conscious, 25% web-friendly and 5% web-confident. We wanted to invest in software which would be seriously considered by the top 60%, realizing that probably half those in the web-conscious group would not utilize whatever was decided upon. It was hoped that a critical mass would form and that our students might start to convince the stragglers that some technology might enhance their teaching/learning environment. Ever the diplomat, far be it from me to claim that ANY set of techniques are appropriate for all faculty and all teaching/learning situations. On the other hand, I wanted to be sure that whatever software we did implement was in fact technophobe-friendly so that those who wanted to jump on board were not immediately overwhelmed by the learning curve.

Since we wished mainly to increase and enhance communication with a minimum of new learning for those who considered themselves web-challenged, we were less interested in products which required the maintenance of web sites, even those advertised as user-friendly and easy to learn. We had some faculty who did not have a web site and did not particularly want one, but they did like the idea of being able to "message" their students without resorting to mass email mailings. They wanted more permanence than email provides and did not especially want to learn how to maintain a listserv. I personally looked into starting a newsgroup but my CSD staff were overworked and it had been 6 months with no movement towards establishing any kind of public message board system for classes. After seeing WebBoard in action at a conference, I immediately appreciated its ease of use and its manageability by the less web friendly faculty member. I found the purchase price reasonable and the CSD staff found the implementation very straightforward. Maintenance by CSD is minimal as the users directly control most aspects of the system. This decreases lead time and turnaround time for all activities. This month, we are purchasing the new updated version 4.0 which may be installed by the time we meet in June. The workshop on Sunday will feature either version 3.5 or 4.0 depending on availability.

Installation

The product currently needs to reside on a computer running Windows 95/98 or NT with greater capacity and better results on an NT work station. We have a Linux server for our campus network so we discussed collaborating with Central Carolina Technical College to see if they might be interested in sharing the license and installing the software on their Alpha server which was running NT if we purchased the software and the two institutions shared the capacity equally. They definitely were interested. We then discovered that their Alpha server was too fast for the software, and that the system would have to be disabled a bit for the software to run—go figure! Obviously they had no interest in doing that. USC Sumter then offered to buy a low end NT system to host WebBoard if CCTC would purchase it. They agreed and we purchased it and had it installed in an afternoon once the system was purchased. We have had it installed for one school year and this paper will summarize some of the experiences we have had—good and bad.

Successes and Failures

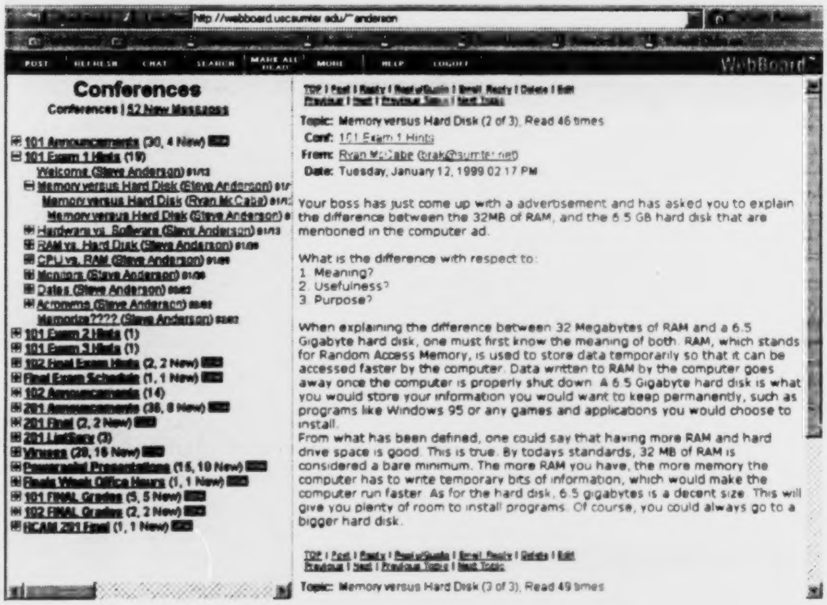
After installation, we found that many were interested in attending a "class" which gave them hands-on experience utilizing WebBoard. Our first session was very well attended, given the short notice, with twenty-plus faculty members from both institutions spending around 90 minutes "in the trenches" setting up their own user profile, setting up their own WebBoard virtual board, and then posting conferences and messages to those conferences. It was considered by all but one to be extremely easy to administer, the exception was a faculty member who admittedly lacking in confidence when they arrived. Even that faculty member now successfully runs their own WebBoard virtual board with very little help. In fact, I have not heard from them for help in months now. One prerequisite was that I not be thought of as "WebBoard Guru" with unlimited time to spend on tutoring and support. I was more than willing to help whenever I could, but I already had a very full plate and no money was forthcoming for support staff. I wanted faculty to feel that help was there if needed, but that it was clearly intended as a system that was easy to start and maintain with a minimum of outside help. There were, of course, exceptions where a board would act in an unusual way and my help was sought out.

One of the big advantages of WebBoard is that there was no special software which faculty and students needed to download (beyond a current browser—Communicator or Internet Explorer 3.* or higher, although I advise 4.* or higher.) One of the best features is the ability to administer the boards from anywhere you have web access. Students need only have an email account if the set up their user profile to include SMTP support so they can read and post messages from any email client. I encourage internet access rather than just having an email account so they have full access to the other resources we post on WebBoard such as web sites for classes, research web sites, etc. Those students who do not yet have internet access outside the computer lab can still utilize the library or lab systems to get free internet access while they are on campus. I encouraged and expected my students to check the WebBoard every couple of days just the way I expect them to read the text book. The good news is—they READ WebBoard!

Another big advantage of WebBoard is that it seems fairly browser-neutral. There seem to be no disadvantages to utilizing either popular browser, as long as they are relatively recent versions. The fact is that our students are encouraging our other faculty to consider using this as a communication tool independently of my own efforts to recruit interested faculty. The best sales job occurs when it comes from the customer base.

The main advantage, as I see it, is that WebBoard has an easy interface . It can be used at a very introductory level for posting messages only if the faculty member simply wants to build an "announcement board" and does not have web site creation skills. It also has search capabilities, chat capabilities, and other message broadcast systems capabilities as well as SMTP capabilities for those wishing to take advantage of that extra power. The very best feature is that anyone can learn to manage a board in a very short amount of time, even if they feel web-challenged.

Examples of Successful Implementations



http://webboard.uscsumter.edu/~anderson
POST
REFRESH
CHAT
SEARCH
MAKE ALL READ
MORE
HELP
LOGOFF
WebBoard
Conferences
Conferences | 52 New Messages
101 Announcements (30, 4 New)
101 Exam 1 Hints (19)
Welcome (Steve Anderson)
Memory versus Hard Disk (Steve Anderson)
Memory versus Hard Disk (Ryan McCabe)
Memory versus Hard Disk (Steve Anderson)
Hardware vs. Software (Steve Anderson)
RAM vs. Hard Disk (Steve Anderson)
CPU vs. RAM (Steve Anderson)
Monitors (Steve Anderson)
Dates (Steve Anderson)
Acronyms (Steve Anderson)
Memories???? (Steve Anderson)
101 Exam 2 Hints (1)
101 Exam 3 Hints (1)
102 Final Exam Hints (2, 2 New)
Final Exam Schedule (1, 1 New)
102 Announcements (14)
201 Announcements (38, 8 New)
201 Final (2, 2 New)
201 ListServ (3)
Viruses (20, 18 New)
Powerpoint Presentations (15, 10 New)
Finals Week Office Hours (1, 1 New)
101 FINAL Grades (5, 5 New)
102 FINAL Grades (2, 2 New)
HCAM 201 Final (1, 1 New)
TOP | Post | Reply | Post w/Quote | Email Reply | Delete | Edit
Previous | Next | Previous Topic | Next Topic

Topic: Memory versus Hard Disk (2 of 3), Read 46 times
Conf: 101 Exam 1 Hints
From: Ryan McCabe (brak@sumter.net)
Date: Tuesday, January 12, 1999 02:17 PM

Your boss has just come up with a advertisement and has asked you to explain the difference between the 32MB of RAM, and the 6.5 GB hard disk that are mentioned in the computer ad.

What is the difference with respect to:
1. Meaning?
2. Usefulness?
3. Purpose?

When explaining the difference between 32 Megabytes of RAM and a 6.5 Gigabyte hard disk, one must first know the meaning of both. RAM, which stands for Random Access Memory, is used to store data temporarily so that it can be accessed faster by the computer. Data written to RAM by the computer goes away once the computer is properly shut down. A 6.5 Gigabyte hard disk is what you would store your information you would want to keep permanently, such as programs like Windows 95 or any games and applications you would choose to install.
From what has been defined, one could say that having more RAM and hard drive space is good. This is true. By todays standards, 32 MB of RAM is considered a bare minimum. The more RAM you have, the more memory the computer has to write temporary bits of information, which would make the computer run faster. As for the hard disk, 6.5 gigabytes is a decent size. This will give you plenty of room to install programs. Of course, you could always go to a bigger hard disk.

TOP | Post | Reply | Post w/Quote | Email Reply | Delete | Edit
Previous | Next | Previous Topic | Next Topic

Topic: Memory versus Hard Disk (3 of 3), Read 49 times

In my computer classes, We utilize webboard as yet another vehicle for class discussions and material and exam review. The most popular conferences are titled "exam review" or "exam hints" as students perceive immediate payback. It is more than just "one more reading assignment." The fact is that the better students DO seem to utilize it more than the weaker students, but there was definitely an increase in communication across the board. I did receive feedback that

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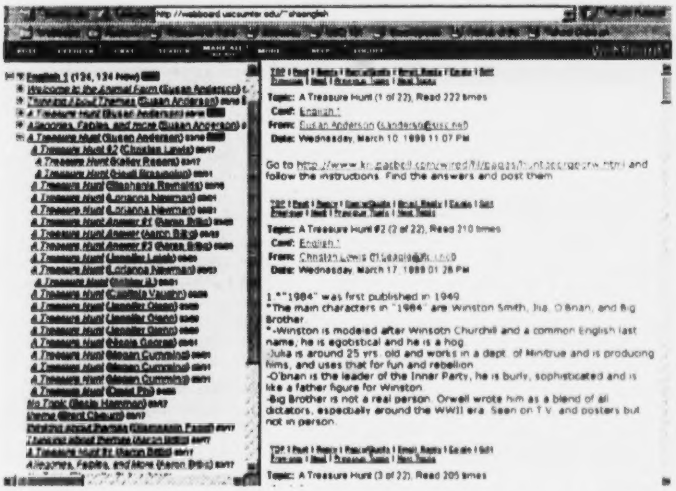
many students feel shy or nervous in class when asked to share. On WebBoard, they felt free to contribute more regularly as they were less afraid to "look dumb" in front of their peers. The ability to stop and think before responding allowed them to formulate an answer which they felt worthy of sharing. In a class where so many new terms are introduced, that turned out to be very positive.

Another benefit of WebBoard has been its ability to grab the attention of at-risk high school students (are MOST "at risk"?) in an English class. The teacher sometimes has a hard time motivating students to turn in written assignments on a regular basis.



Topic: A Treasure Hunt (1 of 22), Read 222 times
Conf: English
From: Susan Anderson
Date: Wednesday, March 10, 1999 11:07 PM

Go to http://www.kn.pacbell.com/wired/fil/pages/huntaccrge.html and follow the instructions. Find the answers and post them

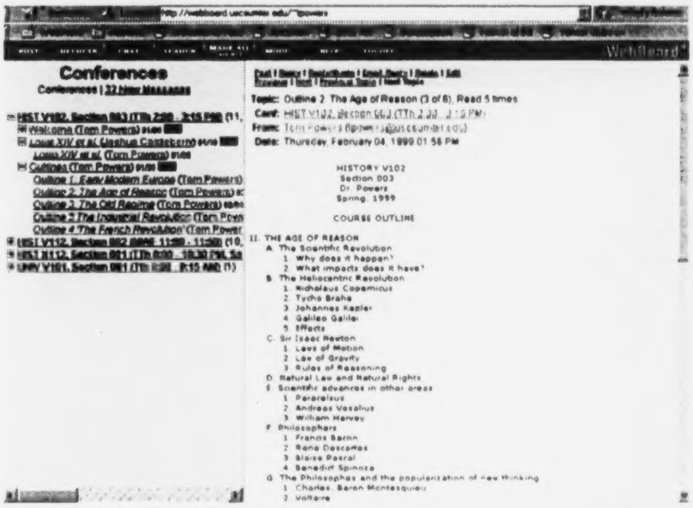
Topic: A Treasure Hunt #2 (2 of 22), Read 210 times
Conf: English
From: Christian Lewis
Date: Wednesday, March 17, 1999 01:28 PM

1.*"1984" was first published in 1949
*The main characters in "1984" are Winston Smith, Julia, O'Brian, and Big Brother
*-Winston is modeled after Winsotn Churchill and a common English last name, he is egotistical and he is a hog
-Julia is around 25 yrs. old and works in a dept. of Minitrue and is producing films, and uses that for fun and rebellion
-O'brian is the leader of the Inner Party, he is burly, sophisticated and is like a father figure for Winston
-Big Brother is not a real person. Orwell wrote him as a blend of all dictators, especially around the WWII era. Seen on T.V. and posters but not in person.

Topic: A Treasure Hunt (3 of 22), Read 205 times

With on-line responses, the students actually went beyond the minimum requirements in most cases. Two students who had not turned in most of the written work, actually outperformed most of the class both in quality and in quantity. One positive and somewhat unexpected outcome might therefore be an increase in communication between students who otherwise have seemingly rejected traditional modes of teaching/learning. A further study of this high school class is underway and will be the subject of future papers and presentations.

One of our history professors has had very positive feedback after utilizing WebBoard to post outlines of major topics covered in his classes. Although most of his communication was one-way, he was able to post announcements and outlines MUCH easier than doing so on a web site.



Topic: Outline 2 The Age of Reason (3 of 8), Read 5 times
Conf: HIST V102, Section 003 (TTh 2:00 - 3:15 PM)
From: Tom Powers
Date: Thursday, February 04, 1999 01:56 PM

HISTORY V102
Section 003
Dr. Powers
Spring, 1999

COURSE OUTLINE

II. THE AGE OF REASON
A. The Scientific Revolution
1. Why does it happen?
2. What impacts does it have?
B. The Heliocentric Revolution
1. Nicholaus Copernicus
2. Tycho Brahe
3. Johannes Kepler
4. Galileo Galilei
5. Effects
C. Sir Isaac Newton
1. Laws of Motion
2. Law of Gravity
3. Rules of Reasoning
D. Natural Law and Natural Rights
E. Scientific advances in other areas
1. Paracelsus
2. Andreas Vesalius
3. William Harvey
F. Philosophers
1. Francis Bacon
2. Rene Descartes
3. Blaise Pascal
4. Benedict Spinoza
G. The Philosophes and the popularization of new thinking
1. Charles, Baron Montesquieu
2. Voltaire

Problems

At first, we had very few problems with WebBoard. Near the end of the Fall semester, one board experienced the loss of some postings while another had some which had incorrect identification of the postings. The latter problem turned out not to be a fault of WebBoard, but rather the way the manager chose their authentication in WebBoard. With "cookie authentication" it became possible for a student to sit at a lab computer, NOT exit the browser from the person sitting there earlier, and end up posting messages looking to the system as if it were the earlier student. We corrected this by changing the board to utilize "basic authentication" and the problem disappeared. The first problem, with messages disappearing, was never properly diagnosed. After discussing the problem further with the history professor whose board experienced the problem, he admitted that it might have been the "nut behind the wheel." I could neither replicate the problem, nor find the lost messages. The problem disappeared as quickly as it appeared.

As always, backups of all important documents and communications are suggested as nothing is fool-proof. During my two semesters utilizing WebBoard, I have lost no messages nor have I heard complaints from students about losing any information. All in all, WebBoard seems like a robust and dependable medium through which announcements can easily be posted. It also serves as a discussion area which seems to encourage lots of students who may not otherwise be so willing to contribute. Over the summer, we plan to implement it in our distance education program in Early Childhood Education which we run in collaboration with a sister campus of the University of South Carolina. Clearly those future teachers have a vested interest in becoming fluent in web-enhanced teaching/learning environments as the grade-schoolers of today are often more web literate than they are. We have a definite opportunity and responsibility to new teachers to encourage them to explore all possible teaching/learning environments, especially those which are web-based. The future is now, and many of us are already are way behind.

Using Microsoft Outlook Web Access to Provide E-mail Service on Public Access Computers

Jamie Anderson
Network Administrator
Pikeville College
Administration Building Rm. 205
214 Sycamore St.
Pikeville, Kentucky 41501
Voice - (606)432-9611
Fax - (606)432-9328
E-mail - jamie@pc.edu

Jim Workman
Director of Information Technology
Pikeville College
Administration Building Rm. 207
214 Sycamore St.
Pikeville, Kentucky 41501
Voice - (606)437-3460
Fax - (606)432-9328
E-mail - workman@pc.edu

Introduction

Many colleges and universities have had a difficult time in deciding how to provide campus E-mail services, particularly in public access areas, such as student computer labs. Pikeville College decided to handle this issue by using Microsoft Outlook Web Access. This is a simple, easy-to-use web based E-mail program that blends in well with a Windows NT network.

In this discussion we will describe the reasons we chose Microsoft Outlook Web Access, the many features of Microsoft Outlook Web Access, the installation and configuration process, and the results from the use of Microsoft Outlook Web Access after its first year on campus.

Reasons for choosing Microsoft Outlook Web Access

Like many educational institutions today, Pikeville College is shifting toward Microsoft NT Server as the backbone of our network, because of its flexibility and ease of installation and maintenance. With Microsoft NT Server and Microsoft Exchange already in place, Microsoft Outlook Web Access was a "great fit." With the prevalence of Microsoft applications and Windows on desktops, especially the stand-alone version of Outlook, Outlook Web Access provides a common and familiar interface to many of our users when they are unable to check their E-mail by more conventional means. The Internet Mail Service provides inter-operability with all Internet-enabled messaging systems without sacrificing the powerful groupware features of Exchange, such as collaboration and calendaring. Microsoft Outlook Web Access extends this power to traveling users, who may be required to use different computers with different software sets, and public access users who cannot configure a conventional mail program to use. The fact that Microsoft Outlook Web Access runs in a browser, without any permanent data transfer to the client, also addresses many of the security and privacy concerns commonly associated with using E-mail on public access computers.

Possibly the greatest feature of Microsoft Outlook Web Access is its accessibility. Because of the fact that Microsoft Outlook Web Access is designed to run inside of a web browser, it can be accessed anywhere in the world. No longer is the user confined to installing and configuring an E-mail program. This is especially comforting for a user that is in a public access computer area, or on a foreign computer. The user just simply launches the web browser (Microsoft Internet Explorer 4.0 or higher / Netscape Communicator 4.0 or higher) and inserts the URL for the Microsoft Exchange Server that Microsoft Outlook Web Access is enabled on. At this point one must enter a valid Login ID (keeping in mind that if on the LAN this person has signed on to the NT server with their NT Login ID) to receive an additional login "box" that requests the users' Login ID and Password. Once the user has finished the session, they must not only choose the "Log Off" option, but also must close the web browser to ensure that the next user doesn't pull their last session back up. This greatly outweighs the alternative that Pikeville College was faced with. Another advantage dealt with our public access computers. Implementing roaming user profiles on a Windows 95 network requires a separate network share on the server for each profile. Each additional share created on an NT server adds to the amount of server resources that must be allocated to listening for network requests. If the number of shares reaches above 500 or so, all but the very largest of servers will choke under the load.

Therefore it was not practical to use roaming profiles, which raises all kinds of security issues with traditional E-mail clients, as well as having to configure the client on each computer for each user.

Features of Microsoft Outlook Web Access

Microsoft Outlook Web Access for Microsoft Exchange Server provides secure access to E-mail, personal calendars, group scheduling and collaboration applications on Microsoft Exchange Server with only a web browser. Microsoft's family of Outlook E-mail and collaboration clients effectively meets the needs of a broad range of users.

As mentioned earlier, probably the greatest feature of Outlook Web Access is accessibility. Now let's take a look at some other features of Outlook Web Access. Of course, basic E-mail functions are available. The use of addressing mail by using Microsoft Exchange's Global Address Book, send and receive file attachments and hyperlinks, set message priorities, request delivery and read receipts, use hierarchical folders and Outlook bar, and group and sort messages in a folder based on standard fields or conversation thread. Basic calendar and group scheduling allows a user to create one-time or recurring appointments in the personal calendar. You can also access day and week views of the calendar, view free and busy times of multiple users and resources when scheduling a meeting, and automatically send a response to meeting requests in E-mail. Public folder access allows a user to access custom table views on public folders or groups and sort messages in a folder based on standard fields or conversation thread. Outlook Web Access also allows you to use collaboration applications. Along with basic public folder support, you can develop custom forms for display in Outlook Web Access using the Microsoft Visual InterDev development system.

Installation and Configuration

Outlook Web Access is implemented by a combination of Microsoft Active Server Pages technology on the web server side and Java controls and scripts downloaded on demand to the user's web browser. According to Microsoft, the server requirements are as follows: Microsoft Exchange Server 5.0 with Microsoft Exchange Service Pack 1.0, Microsoft Internet Information Server (IIS) 3.0 with Active Server Pages installed, and Windows NT Server 4.0 with Service Pack 3.

However, here is what Jamie says you need, based on our year of experience with Exchange and Outlook Web Access. Exchange Server 5.5 with Service Pack 2: Service Pack 2 fixes numerous bugs in Exchange, one of which is a nasty one which sometimes causes the web server Outlook Web Access is on to stop for no apparent reason. Service Pack 2 is also crucial because it provides Year 2000 compliance for all components of Exchange Server, including Outlook Web Access. Internet Information Server 4.0: Active Server Pages, which are the major component of Outlook Web Access's implementation, are flaky at best in IIS 3.0. This upgrade is essential to the stability of the Outlook Web Access server. Windows NT Server 4.0 with Service Pack 4: The main reason I recommend Service Pack 4 is for Year 2000 compliance, but since it's now June of 1999, I think that's a pretty good reason.

Client requirements are as follows: A web browser that supports frames, Java controls and JavaScript, Microsoft Internet Explorer 4.0 and Netscape Communicator 4.0 or higher.

The installation of Outlook Web Access is a fairly simple matter, compared with installing NT Server and Exchange Server. In fact, Outlook Web Access will be installed and set up with a default configuration when you install Exchange Server. But, this may not be the configuration which best suits your needs. For example, in the default setup Outlook Web Access lives in a virtual directory called 'exchange' on the server's main web page. So the URL for our web E-mail was http://pcsom.pc.edu/exchange/default.asp , since the Exchange Server also hosts the web site for our medical school. There were a couple of problems with this. First, we wanted to give our users the easiest URL to remember. Secondly, our Webmaster didn't much want this directory showing up in FrontPage and messing up all his navigation bars. So, what we did was create a second web site on the server. This was really simple in our case, since this server has two network cards in it, but it could just as easily be done on a single interface server by binding a second IP number to it. Next, we created a virtual directory on the new web site called 'exchange' pointing to the Outlook Web Access server files, which are normally in 'c:\exchsvr\webdata'. Lastly, we put a simple redirector page in the root of the new web site, which refreshes to the /exchange/default.asp page. Since we created the server on the same IP number the Exchange Server Internet Mail Service uses, our users can now simply enter http://mail.pc.edu in their browser. Now that the site is set up there are some security issues to look at. By default, the web site is configured to only allow anonymous access, and NT Challenge-Response authentication. This is fine if all your users use Internet Explorer 4.0 or higher. But if you want to allow users to connect to Outlook Web Access from Netscape, then you must disable NT Challenge-Response authentication and enable plain text authentication. Obviously this introduces some security issues, but most standard E-mail clients authenticate in the clear anyway, so it's not as bad as it may seem.

Results

Things We Like:

Roaming or remote access: Users who are away from their PCs, as well as users who share a PC, can take advantage of Outlook Web Access to access their Microsoft Exchange Server information securely from any browser. Because Outlook Web Access doesn't download mail to the client, there is no risk of users accidentally copying messages to another user's hard drive.

UNIX clients and PCs with hardware limitations: Users running UNIX workstations, or users whose PCs lack the RAM or hard disk space for a more full-featured Outlook client, can use Outlook Web Access. Outlook Web Access is not intended to be a replacement for the full-featured Outlook messaging client for Windows or Macintosh operating systems.

Lowest common denominator cross-platform system: Outlook Web Access may meet the needs of organizations that prioritize having identical clients on all platforms and require only simple, baseline E-mail, scheduling and collaborative application functionality.

Extranet applications: Corporations that want to deploy mail, discussion, or collaborative applications to vendors, suppliers, or customers can use Outlook Web Access to distribute them easily, inexpensively, and efficiently over the Internet.

Things we would like to see:

Support for Attachments (This one has been a real thorn in our side!), Personal Address Book, Spell Checking, Microsoft Exchange digital encryption or signature support, S/MIME support, replied and forwarded flags in list view, message flags and inbox rules, three-pane view, drag and drop to folder, search for messages, and WordMail and Microsoft Office integration. Monthly view and other customized views of calendar, display discontinuous days side by side, appointment list views, view details with free and busy, drag and drop to move appointments, track acceptance of meeting attendees, all-day or multiple-day event, task lists and task management, and export to DataLink watch or other devices.

Campus Opinions:

The Information Technology Department is conducting a survey among faculty, staff, and students. The survey will address items, such as, a general rating, ease of use, accessibility, and how often used. We plan to distribute the data that is compiled to those that attend the presentation at the ASCUE conference.

References

Microsoft Exchange Server White Paper, "Outlook Web Access Performance and Extensibility." Microsoft Corporation, 1999.

Microsoft Exchange Server White Paper, "Planning and Deploying Outlook Web Access." Microsoft Corporation, 1998.

Helping Faculty Respond To Changing Technology

Dr. Bruce Bird
Center for the Advancement of Learning and Teaching
Anne Arundel Community College
101College Parkway
Arnold, MD 21012
410-541-2262
blbird@mail.aacc.cc.md.us

Introduction

The impact of revolutionary changes in telecommunications, network, and computer technology on the major components of society has been discussed extensively. The implications of these changes for teaching and learning and upon the delivery of instruction are a major source of concern at all levels of education. One of these concerns is the need to find ways to help faculty in their quest for effective combinations of traditional teaching methods with new methods offered by a constantly changing technology. For example, the recent change in the Web from a static text and image based medium to a medium consisting of audio, video, animation, images, and text illustrates the challenge faculty face as they attempt to find methods of using this new medium effectively. Because of different institutional history, organizational structure, funding, available personnel, and mission each college or university will develop their own unique approach to faculty support. What follows is an account of our attempts at Anne Arundel Community College to help faculty respond to changing technology.

Background

Anne Arundel Community College, established in 1961, is located just north of Annapolis, Maryland on the western shore of the Chesapeake Bay. The college offers seven associate of arts, seven associate of science, and seventeen associate of applied science degree programs, as well as twenty-eight certificate programs. In 1998 it enrolled 44,467 credit and noncredit students in 2000 classes. At present there are approximately 250 full-time and 550 part-time faculty teaching at Anne Arundel.

Over the last three years Anne Arundel has undergone a rapid deployment of technology. Fiber optic cabling was in place on the main campus by the fall of 1996 and computers with Internet connections were placed in faculty offices during 1997. There are now 43 instructional computer labs on the main campus and one central student computer lab. A Chief of Learning Systems and Technology was hired in the summer of 1997 and a Learning Systems and Technology division formed shortly thereafter. Within this division the Information Technology department supports the computer and network infrastructure of the college. Additional faculty support is provided by a full-time Webmaster and by the Media Production Services department. In January 1999 we hired our first Instructional Design specialist. The Institutional Professional Development office also supports faculty by offering training in all the standard Microsoft Office 97 programs.

A key step in developing faculty interest and participation in the use of technology in teaching was the establishment of Online Academy in January of 1998 by the Distance Education office. Online Academy provides a framework for the support and encouragement of faculty in the development and offering of Web based or Web supported courses. As part of the Online Academy program faculty are trained in the use of WebCT and FrontPage 98 to develop Web course materials. This spring about 300 students are participating in 23 online courses. Online courses are added at a rate of about six to eight courses per semester.

Additional support for faculty is available from the college sponsored Designs for Learning, a faculty grant program. While intended to fund faculty proposals in all aspects of teaching and learning many of the recent grants have funded technology related projects.

The Center for the Advancement of Learning and Teaching (CALT) was established to increase faculty awareness of the applications of technology to teaching and learning, to support their efforts to create teaching materials using technology, and to help faculty evaluate and adapt to new technology as it becomes available. In support of this mission a small computer lab was created that contains a wide variety of software and hardware available for faculty use. In addition the CALT Web site contains annotated links to Web sites in the areas of Teaching, Learning, Tutorials, Trends, Electronic Publishing, Educational Technology and Higher Education. Besides links to Web resources faculty can also view Examples that demonstrate the use of software and hardware to create teaching materials for use in the classroom, computer lab, or on the Web. By providing concrete examples of what can be done with new technology we hope to arouse faculty interest so that they are motivated to take workshops offered by CALT covering software and hardware useful for the creation of teaching materials.. At present we are offering workshops on Microsoft FrontPage 98, Macromedia Flash 3.0, and RealSystems: RealProducer G2 and RealPresenter.

Microsoft FrontPage 98

FrontPage 98 is a popular software package for the creation of Web pages and management of Web sites. With this and similar software it is no longer necessary for faculty to learn HTML, or how to FTP files, but can instead concentrate on teaching applications.

Workshops on FrontPage 98 have been offered to faculty and staff for over a year and a half. The computer workshops consist of two, three hour, sessions given a week apart. Materials for the workshop have been placed on a limited access Web site. A printed version of the Web workshop materials is handed out at the workshop as well as the text, Microsoft FrontPage 98 At a Glance, by Stephen L. Nelson. Examples placed on the CALT Web site illustrate applications of FrontPage 98 in the creation of Web pages and teaching materials. After completion of the workshop FrontPage 98 is installed on each participant's office computer . They can also install the software on their home computer allowing them to create and edit their Web pages from home, if they so desire.

In these workshops it became apparent that both faculty and staff had a misconception as to the difficulty of creating Web pages. This was evident from frequent comments as to their surprise on learning how easy it is to create Web pages. They have gone on to use FrontPage 98 to create personal Web pages, course web pages, department and division Web pages, and student club pages. Although we now use WebCT as the main environment for the creation and delivery of Web based courses, several professors still prefer to use FrontPage 98 for their home page, course development and delivery while at the same time using selected parts of WebCT, such as the chat feature.

Macromedia Flash 3.0

Flash 3.0 is a vector drawing, animation, and limited authoring program. Both the Netscape and Microsoft browsers support the free Flash player.

Workshops on Flash 3.0 have been offered to faculty since March of this year. The computer workshops consist of three, two-hour workshops, spaced one to two weeks apart. Materials for the workshop have been placed on a limited access Web site and a printed version of these materials is handed out at the workshop. Examples placed on the CALT Web site illustrate applications of Flash in the creation of animated GIFs, Flash animations for viewing on the Web, and the combination of FrontPage 98 forms with Flash animations for interactive teaching modules. At the end of the first session Flash 3.0 software is installed on the participant's office computer so that it is available to work with between workshop sessions. In addition they are given a copy of the Macromedia Flash 3.0 Users Manual that is part of the software package.

Faculty are surprised that with just an hour of instruction they are able to create animated GIFs for their Web pages. Quite frequently faculty have said that the program is "fun to work with". Professors from a variety of academic disciplines are now in the process of creating supplementary teaching materials on the Web with Flash.

RealSystems: RealProducer G2 and RealPresenter

At the present time RealSystem's technology is the major source of streaming media (audio, video, text, images, Flash animations) on the Web. By streaming media the long wait time for large media files to download onto the student's computer is reduced to 10 or 15 seconds while the initial part of the file loads. The presentation begins to play while the rest of the file is downloading in the backgound. RealProducer G2 is a free software package that converts audio and video files into Real media files that can then be streamed over the Web. RealPresenter is a plug-in for Microsoft PowerPoint 97 that converts PowerPoint slide shows with audio commentary into Real media files.

Workshops on RealProducer G2 and Real Presenter have been offered to faculty starting in April of this year. The workshop consists of one, three-hour session. Materials for the workshop have been placed on a limited access Web site and a printed version of these materials is handed out at the workshop. Prior to the workshop the college Webmaster creates individual faculty directories on the college's Real server. During the workshop faculty use Microsoft Sound Recorder to create an audio file. Then they use RealProducer G2 to convert their sound file to a Real media file. Next they modify a SMIL template to include the name of their Real media file. Then they are shown how to FTP their SMIL and Real media files to the college's Real server. Finally, they use FrontPage 98 to create a Web page with a link to their SMIL file on the college's Real server.

A similar procedure is carried out for the case of a PowerPoint slide presentation. First, faculty create a simple PowerPoint presentation and then use the record feature of PowerPoint 97 to make comments on each slide. With the RealPresenter plug-in installed it then requires only one click of the mouse to convert the PowerPoint file into a Real media file. Once a Real media file is available the remaining procedures are the same as done previously for the audio file. After faculty complete the workshop RealProducer G2, RealPresenter, and FTP software are loaded onto their office computer.

At the time of this writing only one workshop has been offered. We intend to offer this workshop at least once a month for the foreseeable future. The initial reaction of faculty is very positive with all of the workshop participants so far indicating their intent to use streaming media as supplements to their Web teaching materials.

Summary

Our experience thus far at Anne Arundel indicates the need for extensive support for faculty in all aspects of instructional technology. It is important to recognize the already heavy workload of teaching faculty. Faculty not only have to learn new software and hardware for the creation and delivery of course materials, but they must also design the course so that it uses technology in a way that improves student learning. The best combination of released time, incentives, type and amount of training, and methods of support will vary among institutions. It is essential that a good working relationship between faculty and instructional technology personnel be established and maintained. Neither group alone has all the "right answers" to this very human task of finding effective methods of using technology to improve teaching and learning.

Resources

A list of links to articles on faculty and staff development that have appeared at the Horizon site in The Technology Source can be found in its Archives.

The Crisis in Information Technology Support: Has Our Current Model Reached Its Limit? by Polley A. McClure, John W. Smith, and Toby D. Sitko, CAUSE , 1997

Training Instructors in New Technologies, by Pamela Rups, Western Michigan University (T.H.E. Journal, March, 1999)

New Ways to Link Technology and Faculty Development, by Wendy L. Shapiro & G. Phillip Cartwright, Change, 1998.

Links to sites for FrontPage 98, Flash 3.0, and RealSystems Technology can be found at CALT Resources.

Faculty, Instruction, and Information Technology, by Barbara Horgan, August, 1998.

Note: For those reading the printed version of this article the CALT Web address is http://www.aacc.cc.md.us/calt

How We Spent Our Summer Vacation
Or
Doing an ISP in Six Weeks

Terry L. Bratton, Ph.D.
Associate Vice President
Hardin-Simmons University
HSU Box 16040
Abilene, TX 79698
915-670-1589
tbratton@hsutx.edu

Introduction

The decision to become our own ISP was simple. We could continue to spend 70% of our student IT Fee money to pay for Internet access from a local for profit ISP or we could become our own ISP for 30% and leave the other 70% for critical computer needs. The decision was easy, getting the decision approved was a big problem. Most of our efforts were to convince the officers who should do it. The only acceptable answer after nine months of indecision was to do it our selves. After ASCUE last summer, the decision was made and we had six weeks to get the hardware and software ordered, installed, and operational before school started. We were live by the time the faculty and students arrived and by the end of September it was working so well that Internet ceased to be a topic of conversation.

The Need Provided the Opportunity

Our President and Executive Vice President were walking across the campus on the way to a meeting. As is his custom, the President asked a student how he was doing. The student had just come from the computer lab were he had attempted to complete an assignment. The student told the President that he had problems with the exercise that were caused by old computers, old software, and networking problems in the lab. His response caused the President to stop and discuss the problems in the lab. The student mentioned that there was no Internet access, no home pages, and no way for the computer students to learn about the Internet and networking on campus. The President talked with the student for a few more minutes. As the student walked away, the President told the Executive Vice President "we must get that fixed."

Responding to that student input, Hardin-Simmons University realized that they needed to upgrade their technology to meet the needs of the faculty, staff and students. Since the officers had virtually no computer experience, they decided to hire a consultant to review the situation and make a recommendation. A consultant was recommended and came to the campus to review the existing technology and recommend changes for future changes. There was no campus wide network and only four self installed LANtastic networks in departments that decided to "do their own thing". Most of the departmental LANs were in disrepair. There were no standards and no policy to help standardize the networks. The consultant made several recommendations to restructure the

Information Management department, including hiring an information management professional in the Chief Information Officer position to begin the process of updating the campus. He recommended installing a university LAN with several recommendations relating to financing and supporting the new structures. The officers listened to the consultant and adopted his recommendations. One of the recommendations was to reorganize the Information Management department and hire an Associate Vice President of Information Management. I was hired as a result of that recommendation.

The Beginnings

As the officers started the search for an Associate Vice-President to direct the new computer initiative, they began to take action about the recommendation that they need to find a way to finance the new initiative. They decided to add a $75 per semester IT Fee for all students that enrolled for more than 6 hours. As a part of that initiative and as a tangible benefit to the students, it was decided that the university would provide Internet access for all the students paying the IT Fee. The existing Information Management staff had no experience with the Internet and the officers decided to contract with a local Internet Service Provider (ISP) for their Internet support. The contract called for an initial payment of $30 per student to provide each student a copy of a browser with instructions to install the browser and establish a dial-up connection. The population of the university was two thousand students for a total browser cost of $60,000. The contract was a self-renewing with a thirty-day cancellation clause after two years. The monthly rate was $19.95 per enrolled student. There were no charges for faculty and staff. The access was dialup to the modems at the ISP with two ISDN connections to the student lab and one connection to the library.

There were constant problems with the dial-up lines. The students experienced busy signals, no answers (continuous ring with no pickup), a range of error messages and marginal support. The initial contract allowed three FTP logins with a $25 charge for each additional FTP access. The vendor was not very interested in adding more FTP connections. The lack of FTP access severely restricted the opportunity for home pages. Within a year it was obvious that this contract was not meeting the needs of the campus and cost 70% of the students IT Fee. The campus had old labs that were out of date and the university had no resources to upgrade the labs. We chose to lease new systems so that we could upgrade a third of the computers each year. We also decided that we would strive to keep all of the systems not more than two generation older that the current generation. Currently, the systems must not be older than Pentiums (Pentium III is the current generation). This does not mean we will purchase Pentium III systems, but we will replace systems that are older than Pentium.

The problem was that the Internet contract cost 70% of the IT fee leaving only 30% of the IT Fee available for technology leases and purchases. We could not do what we had do to catch up with only 30% if the IT fee. We had to find a better solution.

The Decision

We started looking for other solutions. The most significant cost was the cost of the Internet support. We decided that we had to reduce that cost. We started by asking for new proposals from our ISP vendor and other ISP vendors in the community. The proposals we received provided some reduced cost (we eliminated the cost of software since browsers were free to higher education).

However, we did not find a significant saving with the vendor providing the service. We then began to consider purchasing the hardware with local support to help with the installation and support. The vendors proposed on-site hardware, but the cost to the university did not change, as the vendors did not want to give up their revenue. As time progressed and we began to see that the only answer was to install and operate our own ISP. The estimated cost to install and maintain our own ISP would cost approximately 30% of our annual IT Fee, averaging the cost of installation over three years. This plan included the personnel for the Help Desk, hardware and software to customize the browser, the communications hardware (paid in three annual payments), and all of the communication costs.

We now had a plan and two potential vendors for the hardware and Help Desk support. So we were ready to go. **WRONG**. Now the politics started. Both local vendors had investors that were active and influential HSU alumni and both wanted the contract to provide the best equipment for the institution. Both were convinced that their company could do the best job of providing and installing the hardware. The proposals were unique to each vendor. This began a period of negotiation that lasted several months. Each time we thought we had a solution, a new problem or controversy arose. This basically continued from November to June. Our original proposal was to begin training in January with the installation in March or April giving us several months to train our personnel, install the hardware and test the new system. These months of no progress erased all opportunity to do an orderly installation.

The Solution to the Dilemma

Eventually, we began to understand that we could not negotiate a solution. A few weeks before ASCUE last year, be began to put a scenario together that would allow us to do our own installation and buy hardware or services from both vendors. This was discussed with the Executive Vice President and he discussed it with the President. They agreed to the new plan if a consultant would review our plan and affirm that the plan would work. We talked to Baylor University and were able to retain their Internet and network person to review our plan. He came and reviewed our approach and our plan and recommended that we proceed. While I was at ASCUE last year, the officers approved the plan with the recommendation of the consultant and we received permission and funding to proceed. It was June and the ISP had to be operational in August. We finalized the configuration, requested the purchase orders and began the process. No time for training, no time to learn what we need to know. We had to depend on our vendors to provide the design and information we needed to make the configuration work. Neither vendor had never provided an ISP for a university setting and did not understand the complexity of the university environment.

The Installation

We chose Sun Sparc stations for the Web and mail servers. We chose Bay Networks hardware to handle the network and the communication to the Internet (both companies supported Bay Networks hardware). We leased a T1 through one of the local vendors. We found a bank of 40 used analog 33.6 modems that we purchased. We ordered 48 new digital modems, and leased two PRI (digital dialup) connections. When we placed the orders for the two PRI lines, we discovered that the local Southwestern Bell office did not have the capacity to supply the PRI lines that we needed. We also learned that one of the local for profit ISP's and another local college also was seeking additional PRI lines. Southwestern Bell told us it would be several months before we could get the PRI lines.

We negotiated with Southwestern Bell and finally got them to add the capacity we needed.

We contacted InterNIC and requested a class B Internet address. We quickly learned that there was no Internet address available and that we had to get our address from the vendor that supplied the T1 connection to the Internet. This was a problem because we could only get a class C address that provided 256 addresses. This caused a new crisis, as we needed more that 256 addresses. We were having significant problems configuring the Bay Networks equipment, and now we had new problems with addresses. We finally got the Bay Networks equipment configured and working for the Internet, but we had to redesign for more addresses.

We solved the addressing problem by installing a Watchguard firewall device that allowed us to create a private network behind the firewall, providing all the address structures we needed. We established two domains, one domain for the students and one domain for faculty, staff, and administration. We finally got the hardware and software working and then had problems getting the Internet to recognize our new address. Eventually, all of these things were overcome and the systems began to crawl forward.

We were to be fully operational by the time the students arrived. We worked long days and nights to get all the settings correct and in harmony with each other. We would get a part of the network working and as soon as we added new parts and had them working, the parts that were working quit working. This was a very tiring and frustrating process. Both companies were helping us and many times the recommendation of one conflicted with the other and caused problems. Eventually we began to see some progress and it began to function. We underestimated the complexity of multiple vendors. If we ever do something like this again, we will choose one vender to supply all the pieces. The biggest problem was that we did not have anyone who had put this exact configuration together. The complexity of Bay Networks made the decision to use their hardware a bad decision. Not that Bay Networks in not a great product, but the short time we had to get it working with no local expert support made it a bad decision. If we were doing it again, with no training, we would have chosen 3Com as the vendor. They are not necessarily better, but they are not as complex.

We were live by the time the students arrived. We had some problems we did not anticipate as the students began to use the system. One problem was with the analog modems. Some of the used modems were not working and we had to disable them and cluster the broken modems at the end of the string. We had two sets of the modems repaired.

We discovered that we needed our own help desk. We initially contracted with a local ISP to handle the Help Desk calls. We quickly learned that we could not keep them up to date with the rapid changes we were making. Also, they were not updating and distributing the updates we were giving them to their workers and the students were upset because they could not get their Internet connections working with the old information. We created a new position to oversee the Help Desk and hired students to answer the phones. We learned that our students knew more than the Help Desk people that we had contracted to help us and were significantly more committed to our cause. After a few months, we found that we were getting very few calls after 5 PM and decided to cancel the contracted Help Desk support. We now operate the Help Desk from 8:00 AM to 5:00 PM Monday through Friday and it is working well. We have voice mail available 24 hours a day to record message from students having problems. We had no complaints after the cancellation of the external Help Desk support.

Success

By the middle of September the system became very stable. We found that we had to add phone capacity since all of our students were dialing into the modem pool. They used regular phone lines to call the modems and overloaded the phone system. Sometimes students could not get an outside line and sometimes when parents called they got busy signals. We added twenty additional phone circuits and solved that problem. The analog modems are occasionally all busy, but the digital modems so far have not all been busy at the same time. By the middle of September the systems were working great and continue to work very smoothly.

We are working to network the campus and will have one dorm wired for direct network access before fall. We have all but three administrative buildings connected to the network. We have no fiber between building (estimated cost of one million dollars). We determined that we had unused pairs of phone lines to the buildings we wished to put on the network, chose Tut boxes to provide the connections between the buildings. The Tut boxes will provide 10-Megabit Ethernet capability if the length was less than 1500 feet. We get 2-Megabit capability over 1500 feet. The Tut boxes are working great. We are evaluating microwave, sound and laser connections to bring all the connections to 10- megabit.

We are seeking grants to wire the other dorms. The administration is considering paying off the remainder of the cost of the ISP installation that was to be spread over two more years out of the surplus for this year. If that occurs, well will spend less than ten percent of our IT Fees to provide our ISP to our campus. We will be adding three additional labs on campus this summer and all will have direct network access.

What Would We Have Done Differently?

Obviously, we should have done training **before** we installed the hardware. We would have spent more time planning and designing our network configuration. We would seek more help with the design of the network. We are now making changes that should have been done initially. We are considering replacing all the Bay Networks hardware with 3Com hardware because of the difficulty of configuring the Bay Networks routers and controllers. We would probably not choose Bay Networks again. Not that Bay Networks is bad, as a matter of fact they are very good, but they are significantly more difficult to configure. The training is expensive and there are many courses. Bay Networks also require very expensive software to reprogram their equipment. We are currently paying a local vendor to reprogram our Bay Networks equipment. They are probably more flexible, and have more capability, but we may not need that flexibly and capability they provide. It is very important for us to be able to control our own destiny.

Conclusion

Did we make a good decision? **Yes!** Do not try to do this in six weeks, **but do it**. The students say our service is significantly better than the previous vendor in all areas is. Faculty, staff and students are very happy with the access and the faculty is beginning to use the Internet in their classes, which is expanding to other technologies. The use of the Internet and other media is increasing. We provide access to faculty and staff for personal and departmental home pages. We encourage students to build their own home pages in the student system. We will upgrade the student side of the network this summer providing more access and space for educational and personal use. The total out of pocket cost of this installation, not counting our labor was $164,000.

This plan has worked for us. It has been less expensive than outside services, it has allowed us to more effectively use the IT Fee resources, and it has given us the flexibility to do what we want to do. It has increased the use of technology on our campus and the students are very happy with the new capabilities. Since we have a fixed cost, we can provide local Internet for those that have retired from Hardin-Simmons. We are also considering providing Internet accesses for active alumni in our area. We may provide an 800 number for active donors.

Would I recommend this for another school? Yes, but not in six weeks.

Web-Based Teaching Tools for On-line Interactive Learning

Ifay F. Chang, Humbert Suarez, and Tom Cheng
Polytechnic Research Institute for Development and Enterprise
Polytechnic University
6 MetroTech Center
Brooklyn, N.Y. 11201

Abstract

On-line interactive teaching is a new paradigm that has drawn considerable attention in the higher education arena. Faculty of many different disciplines have taken somewhat different views towards experimenting with or accepting this paradigm. Some have introduced web technology into classroom teaching and others have begun developing complete web-based on-line interactive courses. At Polytechnic University, a web-basedteaching and learning environment, I-CARE, which can be used both in classrooms and on-line has been developed since 1995. Since I-CARE's introduction, many valuable lessons were learned which also demanded some new requirements of the system. Two of such requirements, an on-line mathematical equation writer and an on-line exam creator have been recently developed. The equation writer is based on the LaTex. The exam tool supports multiple choice and short answer tests, auto-grading as well as creation of non-standard tests. The rationale, design details, comparisons with other existing tools and future research work are the main focus of this paper. Both tools are functional and can be demonstrated on-line. (http://pride-sun.poly.edu/icare)

Introduction

On-line learning has gained more acceptance recently (1), especially in higher education and professional training. (2, 3) The advances in web technology has made on-line learning more versatile in that both asynchronous and synchronous interactions between and among instructors and students are very feasible with today's network capability. (4)

We have initiated a research project in1995 to build an on-line education system, I-CARE, for exploring the distanceless education paradigm. (5, 6) I-CARE consists of three subsystems for administration, teaching and learning respectively. The system is designed with an open architecture with a common user interface, the Internet browser, and a set of teaching and learning tools, the virtual classroom, both fully compatible with the Internet communication protocols and the web programming languages. The details of the system design and its early user feedback was presented at the 1998 ASCUE conference and ALN on-line magazine. (7,8)

Since the introduction of web-based on-line teaching at Polytechnic University, many valuable lessons and feedback have been received from faculty and students. Although not all tools contained in the I-CARE system have been fully exploited by our faculty and students, but we have learned that some new tools have to be developed in order to make on-line teaching and learning more effective. It is also clear to us that maintaining the I-CARE system on an open platform is absolutely essential so that new web technologies can be easily incorporated and new tools can be readily developed as needs arise. For example, streaming audio and video technologies as well as Internet telephony can be integrated with I-CARE. (9) In this paper, we describe two new tools, both necessary for science and engineering teaching. The first one is an on-line mathematical equation writer and the second is an on-line exam creation tool.

The rationale of doing this development, the detailed design of these web-based tools, their comparisons with other existing tools as well as their future enhancements are the main discussion of this paper.

Rationale and Design Principles

Equation Writer

Equations are used extensively in academia, particularly in topics covering Mathematics, Science and Engineering. However, to incorporate equations on a web-based courseware system, the system must support the use of either a meta-markup language (e.g. XML), a type-setting language (e.g. LaTeX), or some proprietary third party tools. The primary reason is because an equation can be difficult to display on the Web since some make use of complex symbols most notably in Greek or Roman. Furthermore, equations cannot easily be written with a typical computer keyboard.

The following are some of the design principles that were taken into consideration:

A user-friendly interface for inputting an equation is necessary. The interface should not make it difficult or time-consuming for the user to construct an equation.

Using either a meta-markup language or type-setting language to create an equation is difficult because it requires users to understand a language prior to writing the equation. However, it is easier and less time-consuming for people who are relatively familiar with them.

Using a proprietary third party tool (e.g. such as Microsoft Equations 2.0 available on Microsoft Word documents) locks the user into a specific format for designing their course. To accommodate users of these tools, a mechanism should allow the user to import equations created by these tools.

Designing an effective equation writer can be very complex. Regardless of its complexities, it is nevertheless a very important tool particularly for educators who wish to develop and teach technical and scientific courses.

Exam Tool

An important process in education involves assessing and evaluating student comprehension of course material and learning effectiveness. All educational institutions usually require students to conduct some form of performance assessment such as doing homework, working on projects, and/or taking exams. The latter is especially valuable because the assessment collected from exams provides educators with a better understanding of the effectiveness of their course materials and their approach to teaching. In the case of on-line course delivery, exams provide a productive means of evaluation since it is rather difficult for an instructor teaching an on-line course to visually notice whether or not he or she is coming across to the students. Furthermore, Quizzes can be designed to lessen the dependence on students' voluntary feedback and can give students an active way of testing their own understanding of the course material.

In the development of an on-line Exam tool, it is important to consider the following principles:

The tool should be able to create exams of different formats and question types. A single format will hinder the flexibility in exam creation and the effectiveness of the exam.

The tool should be capable of utilizing the World Wide Web as a resource such as giving access to video, audio, images, and web pages. An on-line exam tool is similar to a take-home or open-book exam in the traditional classroom setting. Therefore, it does not make sense to have an exam tool that prevents students from taking advantage of materials available to them on the Web. However, a timed exam is desirable to test students' problem solving ability.

Conversely, it would be counterproductive to give students an unlimited amount of time to view the resources available to them on the Web. This puts instructors in the situation of having to create exam questions that would be extremely difficult to answer.

Sufficient automation to handle a very large number of students taking the exam (for instance, freshman class of physics or introductory computer science).

A mechanism should be developed to enable students and instructors to track progress. Students may also be interested in reviewing through the exam to learn from their mistakes. Instructors may want to give helpful comments and suggestions to their students regarding specific exam questions.

A mechanism to prevent students from cheating should be addressed. The exam tool might include a method of having each exam different for every student. A more elaborate scheme may be to create a technique for uniquely identifying a student.

The latter principle may be the most difficult to address since there is no guarantee that any single method would achieve its purpose. It is important to design a tool to be flexible and robust without being too restrictive to its users.

Descriptions of the Tools

Equation Writer

I-CARE's equation writer is based on LaTeX (10), a set of generalized markup language macros created from the TeX (11) typesetting language. LaTeX has been widely used by the engineering and scientific community since 1985. More specifically, in order to display LaTeX content on the Web, the equation writer make use of a program called LaTeX2HTML (12) to convert the equation created with LaTeX into an image that can be readily displayed on any web browser. The equation writer uses a simple form-based interface (refer to Appendix A) which prompts the user to enter a line of LaTeX markup representing the equation. Once the user submits the form, the LaTeX2HTML program processes the markup and stores the newly created equation for use by the I-CARE authoring tool. Alternatively, users who are unfamiliar with LaTeX may use any third party application to create an equation and imported into the I-CARE system using the image or equation upload tool. The user must first convert the equation into an image either through tools provided by the third party application or using screen capture software.

Exam Tool

I-CARE's exam tool emphasizes the simplicity of exam creation while providing a number of options in exam delivery and presentation (refer to Appendix B). It includes all of the common features of other products but differs in that questions are created with the support of I-CARE's courseware authoring tool. This method eliminates the need for different question type templates and gives instructors enhanced flexibility in designing questions through the use of a common interface. Therefore, I-CARE's exam tool can generate questions that can emulate some of the question types available in TopClass and WebCT without the need for different templates and interfaces. One example would be a list-matching question as shown below.

Column A	Column B
1. New York	A. Honolulu
2. New Jersey	B. Albany
3. Hawaii	C. Trenton

Match Column A to Column B.

Fig 1: Example of typical list-matching question.

A list-matching question would usually require a student to draw a line to match items in Column A to items in Column B. Since I-CARE's authoring can create lists and tables, an alternative way to doing this problem is a simple multiple-choice question listing a number of options.

Column A	Column B
1. New York	A. Honolulu
2. New Jersey	B. Albany
3. Hawaii	C. Trenton

Which answer correctly matches items from Column A to Column B?
1 to C, 2 to A, 3 to B
1 to A, 2 to B, 3 to C
1 to B, 2 to C, 3 to A

Fig 2: I-CARE's implementation of list-matching using multiple-choice

Naturally, question types such as true/false and multiple correct answer can be done with multiple-choice format as well.

The authoring capabilities also allow users to create questions requiring the use of mathematical equations (see Section A on the Equation Writer), hyperlinks to course materials or to other resources outside of the course (i.e. audio, video, and documents), tables, and images.

For exam delivery and presentation, I-CARE offers timed exams and one question at-a-time testing capability. Exams can be displayed or removed from the student exam list and modified at any time.

The exam editing capabilities permits changes and modifications to every part of the exam. Instructors can offer more than simple comments on student grades with the use of the answer key tool. Students can review through the results of each exam and learned from their mistakes by looking at the answer key made available by the instructor. Instructors also have the ability to modify grades and recover one question at-a-time exams that may not have been completed due to an interruption. This feature is especially important for exams given on-line due to possible power outages or server interruptions/failures.

Comparisons with Other Existing Tools

Equation Writer

The common on-line courseware authoring systems do not provide a built-in equation writing tool. However, there are a growing number of options that are available for creating equations and displaying them on the web. The most notable option is the advent of XML (a.k.a. extensible markup language). Similar to HTML markup but different in its extensibility, XML allows users to define tags through the use of a Document Type Definition (DTD). If a user wanted to display an equation on a web page, the user would first create a DTD and use the tags to develop equations. The detailed instructions on how to render those tags are provided by a style sheet that is attached to the web document.(13) Currently, many browsers do not yet support XML. However, Netscape and Microsoft have confirmed that future versions of their browsers will soon support this markup language and the World Wide Web Consortium has already made it a standard.

Exam Tool

Most major providers of on-line course delivery applications (14), such as BlackBoard (http://www.blackboard.net), WBT Systems (http://www.wbtsystems.com), and WebCT (http://www.webct.com) offer an on-line exam or quiz tool. Common features among all these tools include multiple choice and short answer question types, assigned point values to questions, automatic grading for the aforementioned question types, embedded graphics capabilities, and gradebook for students and instructors. However, these tools differ in their approach to exam creation, presentation, and delivery.

BlackBoard aims at simplicity by providing a single exam format (all questions reside in a single page). Grading of these exams can be made optional thus allowing the exam tool to double as an on-line surveying tool. In addition to the previous question types, BlackBoard includes essay and fill-in-the-blank questions. A gradebook displaying student access and progress data is available.

WBT System's offering called TopClass possesses a robust exam tool that is rich in feature and functionality. It includes additional question types such as fill-in-the-blank, multiple correct answer, image map, list matching, essay, true/false, and upload. Question pooling and random question generation is available for instructors who wish to deliver a different exam for different students. Instructors also have an assortment of options in exam presentation with timed exams and one question at-a-time testing capability. Grades statistics are available in either graphical or numerical format and can be delivered to students through e-mail. Instructors can also include comments with their grades.

WebCT includes all of TopClasses' question types (with the exception of image map) and offers the ability to generate random values for variables, thus giving a single question different looks to different students. Exams are presented to students in single page format as in BlackBoard but with the option of a timer. Grades are also available in graphical or numerical format and instructors may include comments next to each grade.

Discussion and Future Work

Web-based educational tools are gaining importance. The following table lists the applications of web-based tools in different teaching/learning modes and environments for delivering different functions. Although there are many traditional off-line PC-based tools for educational use in classroom and off classroom, there is a clear trend that they are either evolving into or are already replaced by web-based tools.

Application of Web-based Tools		
Preparation of Content (Authoring)	**On-line Authoring** HTML Optional Hyperlink, Exam, Equation Text, Image, Audio, Video Search Resources WYSIWYG Publish Real-time Interactive	**Off-line Authoring** PC-based Tools * HTML Based Tools
Teaching (Knowledge Delivery)	**On-line In-classroom** Lecture Notes, Audio & Video Streaming Projection, Search Engine, Digital Library (Resources)	**Off-line In-classroom** Slides of HTML Pages
	On-line Off-classroom Lecture notes, Audio & Video streaming, Homework Tool, Forum, Bulletin Board, Calendar, Event scheduler, E-mail, Chat, I-phone, Exam Tool	**Off-line Off-classroom** CD (HTML Optional)
Learning (Learner Activities)	**On-line In-classroom** Lecture notes, Audio & Video streaming, Search engine	**Off-line In-classroom** Slides of HTML Pages

	On-line Off-classroom Lecture notes, Audio & Video streaming, Bulletin board, Appointment Tool, E-mail, Chat, I-Phone	**Off-lineOff-classroom** Download & Print HTML
Assessment (Test and Evaluation)	**On-line In-classroom** Exam/Quiz, Attendance, Grade Report	**Off-line In-classroom** PC Based Tools *
	On-line Off-classroom Exam/Quiz, Logon data, Grade report	**Off-line Off-classroom** PC Based Tools *

*Today, tools used on PC's are seldom standalone as more and more PC-based tools are being replaced by web-based tools; in other words, web-based tools will be applicable in all modes and environments.

I-CARE, being an open platform system, (15,16) has successfully incorporated many web-based tools to create a virtual classroom which can be used for traditional classroom as well as on-line teaching and learning. These tools serve as alternatives to using PC-based and traditional tools (blackboard and chalk, slide projector and the like). However, their effectiveness is still yet to be quantitatively confirmed. In the past several years of research and development, I-CARE has recognized many requirements of the educational community and has taken the initiative to drive towards a complete solution for developing and delivering on-line education and training. A complete solution will take sometime to evolve into a pedagogically satisfactory system. Therefore, it is important for I-CARE to maintain as an open platform (in contrast to commercial closed systems) and to continually work with on-line education practitioners to extend its web-based tool set to support the development of an effective on-line pedagogy.

Several extensions to the tools described in this paper are currently under consideration. To follow I-CARE's promise of an open platform, the equation writer is in the process of being ported to Windows NT and research is being conducted on the possible use of XML to create equations. Furthermore, the essay and image map questions are both examples of very useful question types and are being developed for the next version of the I-CARE's exam tool. Question pooling and random question generation would also be desired since currently all students would receive the same exam. However, the impact on simplicity in exam creation must be addressed with this possible addition. More advanced student grading features should also be developed to allow adding offline grades and performing statistical graphical data analysis. These new developments do require close collaboration with the academic community, both faculty and students, to achieve the right solutions

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The Role of the Web in Enhancing Student Learning

Mary V. Connolly
Mathematics Department
Saint Mary's College
Notre Dame, IN 46556
219-284-4497
connolly@saintmarys.edu

Over the last few years one of the hot topics on campuses and at conferences has been how to use the rich resources of the web in our courses. Often the assumption behind these discussions has been that we would use as many of the new electronic capabilities as possible; hence a good deal of work has gone into selecting tools and putting resources on line. While all of this work is surely necessary and ultimately useful, I suggest that we should start the process quite differently. We should recognize that this revolution in our electronic capabilities calls us more than ever to reexamine the goals of our programs and courses first, and then ask what the best tools are to accomplish these goals. Surely our primary goal is effective student learning; any assessment of possible tools must ask hard questions about whether the tools truly enhance student learning. A few caveats about this discussion. First, we will focus on activities appropriate for classes which meet on campus; questions about distance learning are left for others with much more experience in this area. Also, this discussion is not meant to be a comparison of tools or course management systems; rather, we will concentrate on identifying goals and assessing how effectively we meet those goals.

Let us first consider then what we mean by effective student learning. Beginning college students view their work as the acquisition of knowledge and are not particularly happy when their faculty seem to expect more. Our ultimate goal is to graduate students who can continue to learn on their own. Dr. Peter Smith, in his paper on Process Education, discussed the stages of the learning process, a model developed by Dr. Daniel Apple of Pacific Crest Software. The last two stages are accomplished when a student can ask her own critical thinking questions and, ultimately, has the ability to develop her own learning processes. [2,158]. The more quickly we can convince students that education is not just mastering content, the greater the chance that students will become the independent learners we hope to graduate.

Nevertheless, each discipline and each course within that discipline, does have its own set of goals. The faculty at Saint Mary's spent consider time thinking together and formally writing the goals for the computer science program. Briefly, we expect our graduates to have developed their problem solving skills and to able to apply these to all phases of the software development life cycle. We expect our graduates to be able to communicate effectively, to stay abreast of changes in the field, to have formed ethical principles which will guide her in her career and to be able to work effectively in a team environment. A student could not achieve these goals if she does not become able to develop her own learning processes. However, these goals are clearly tied to the discipline of computer science.

Prof. David Field of DePauw University has developed a stellar course in the history of the novel. He worked with Carl Singer, the Director of Academic Computing at DePauw, to use technology to enhance his course. What actually happened is that the course became an incredibly rich experience for students and a real model for the effective use of technology. However, the process began with hours of discussion about the goals for the course and its overall structure. While engaged in these discussions, the theme of the course became clear in a way that it had not been clear before. It is no wonder that this course is as impressive as it is. Technology is used to support the clearly identified goals of the course. [1,50].

Goals, then, come first. Once we have a clear idea of what it is we wish to accomplish, we can go about the business of selecting the tools to accomplish these goals. Assessment is based on our goals, not on the tools used. As we consider many of the resources available on the web, let us assume that at very least one of our goals is to promote independent, active learners.

One of the real advantages of the web is that it does enable us to make rich resources available to our students. Typically, faculty post the syllabus, perhaps with more explanation about goals than would be included if the syllabus appeared on a piece of paper In addition, many other resources are usually posted, including notes, documentation, assignments, reading outlines, links to other materials and sometimes even a virtual library. Does this lead to more active, independent learning? The answer can be yes, if the student is held responsible for the information posted. For example, if the documentation a student needs for a piece of software is posted, the student should be expected to dig through this to get her questions answered, rather than camp outside her professor's office.

Links to other resources can be helpful at getting students started with their own research. In many disciplines, multimedia demos are really helpful at getting students to see what is happening. For example, a three dimensional figure can be rotated on a screen so that the student sees the figure from different perspectives. While this is better than a two dimensional drawing done on a blackboard, it becomes a much more effective tool if students can run the model themselves, several times, outside of class. Certainly one of the great strengths of Prof. Field's course is the way in which he assembled the resources. Students can understand the art, music and history of the period in question seamlessly, leaving class time to be spent in analysis and discussion tied to the goals of the course. Hence the posting of resources, rich as they might be, is not the end in itself. We need to structure the class so that these resources are used to accomplish the goals of the class.

Almost all web courseware advertises its ability to enhance communication among students and faculty. One could argue that the new modes of electronic communication have more appeal to students than the more traditional modes. However, if an online posting by a student simply replaces a written paper, we may have gained speed of transmission but we have not necessarily added to the effectiveness of the learning process. Postings can be used though to foster an outside of class discussion that takes on a life of its own. We all are delighted when we learn that students have carried the ideas of the course well beyond the classroom, when the processing of those ideas no longer depends on the faculty member. Then we know students are indeed independent, active learners. Once again, the new forms of communication, exciting as they may be, are not an end in themselves. If we choose to use these, we need to be sure that they are used in such a way as to accomplish the goals of the class.

The web, of course, enables us to assign tasks of a very different nature than we could before the web. Students might be asked to create a web site, rather than write a term paper. Assignments might be individualized in a way that was not possible before. Again, all of this is exciting, but useful only if students learn more effectively. Designing and implementing a web site is a very different kind of project than writing a term paper. Even a text based web site requires a very different kind of writing than a continuous paper. If we choose to make such as assignment, it should be because the web page assignment accomplishes the goals of the course more effectively than a term paper assignment.

Web courseware makes available a number of tools for record keeping, often making it possible for students to know how they are doing in the course at any moment. While faculty might choose to use these tools because it enables them to work more efficiently, of themselves these tools do not enhance student learning. On the other hand, if one of the goals of the course is to develop the ability of the students to do self assessment of learning, these tools might be just what is needed. Once again, it is not the tool that is at issue. Rather, we need to ask whether this is the best tool to accomplish the goal in question.

We have discussed only the most obvious uses of the web in course work. This is deliberate, as this discussion is not meant as a review of web tools. Rather it is a plea to keep goals in mind as we develop courses. We all need to be exposed to how others have used the web in really creative ways to enhance student learning in their courses. That helps us see the possibilities, and the possibilities today are indeed exciting. But then our own process must begin at the proper beginning, by asking what we want our students to learn. Only then can we choose the best tools to use.

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Ten Years of Ubiquitous Computing: Lessons Learned from the Creative Use of Technology to Enhance the Liberal Arts Curriculum

Priscilla R. Danheiser
Vice-President for Academic Affairs and Dean of the College
priscilla_danheiser@post.wesleyan-college.edu

Barbara Donovan
Assistant Professor, Political Science
barbara_donovan@post.wesleyan-college.edu

Philip Taylor
Associate Professor, Economics
phil_taylor@post.wesleyan-college.edu

Barry Rhoades
Assistant Professor, Biology
barry_rhoades@post.wesleyan-college.edu

Wesleyan College
4760 Forsyth Road
Macon, Georgia 31210

Introduction

Wesleyan College launched a ubiquitous computing program in 1988. Through Computer Focus, each Wesleyan student upon entering the college receives computing hardware, software, and library and Internet access housed in her residence hall room. Within a learner-centered, process-oriented curriculum, the goal of Computer Focus is the active engagement of each student in the creative use of technology to enhance each course experience. In history classes, students conduct census research using the internet; in an ancient philosophy class, students use the Web as an information source; most courses have e-mail conferences which encourage students to reflect upon and talk about course material beyond class time; students are completing class exercises on Web access, Web searches, following links, and evaluating Web sites; they are completing simulations of extinction and fruit fly breeding in biology; they are conducting electrophysiological recording and analysis and acoustical analysis; in political science courses, students are using on-line syllabi that link to readings, sites that provide gateways for research, and sites for simulation or other forms of content illustration. In academically-focused first-year seminars, students are designing their own project-related Web sites as early as the third week of their first semester at Wesleyan.

In this session, we propose to discuss how and why Wesleyan committed so long ago to enhance the academic program in this way and how this commitment has changed the culture of learning at our college. To create an interactive session, we will ask participants to share ways their campuses have used technology to enhance learning, why they have focused efforts here, what the results of these efforts have been, and what they see as the future of technology in creating distinctive and effective cultures of learning.

Wesleyan First-Year Seminar: Performing the Past

"Performing the Past" was one of thirteen seminars available to Wesleyan's first-year students. Among other related assignments, students in this seminar chose sites or important elements in Wesleyan's history to evaluate.

The Wesleyan history portion of the seminar was grounded in the work of Maurice Halbwachs. In his book, On Collective Memory, he theorized that each person's memory is part of a greater collective memory in a society, a society that controls individual memory through the use of "prompts"—objects, sites, sounds, smells, or other elements that recall a memory and localize it.

In the students' research, the prompts became locations or traditions around the campus, referred to as "memory points," that triggered memory recall for individuals, and when combined with those of other individuals, for the Wesleyan society as a whole. Each student chose a memory point, researched its factual history, interviewed members of the Wesleyan community, and related what she learned to Halbwachs's theory.

In the course of researching their memory points, students were able to witness the processes of prompting and localizing. When interviewing alumnae and teachers for her memory point, each of the students found common ground.

Aside from the papers presented, the students were taught how to navigate the World Wide Web and create their own homepages for their work. The goal for the website is to build on it as part of a collective memory project, and work toward a larger Wesleyan Anthropology website which will have many components. The African Civilizations students started a website on African art at the Tubman Museum, and students in Anthropology of Nature will develop a website on the campus woods and the Ocmulgee Indian Mounds.

Teaching, Learning, and the Web-Centered Classroom

There are three ways of integrating the WWW into college courses, through the web-enhanced course, the web-centered course, and the web-course. In this presentation, we focus on the second of those, the web-centered course. The web-centered course, which integrates Internet material into the class-room experience -- in effect creating a 'classroom without walls' – facilitates interactive learning, information processing, and critical thinking.

The on-line syllabus for POL 330 State and Local Politics serves as a venue for course information, a reserve and reference shelf, interactive learning tools (we call these plug-ins), and student presentations. In particular, students use the Internet to find, access, analyze, and interpret empirical data and other political science resources. They bring their findings back into the classroom and these are then "plugged in" to the classroom discussion. These exercises facilitate student access and interaction with the wealth of political science resources now available over the WWW; active learning; and critical evaluation of the material encountered on the WWW. A web-centered classroom enhances learning by providing opportunities for active, student-centered learning and inquiry-based learning and to apply critical thinking skills.

Business and Economics: The Use of Competitive Games and Market Simulations

"Learner-centered," "Process-oriented," "Actively-engaged," "Student Involvement."

When an economist hears these concepts, one place comes to mind—the marketplace. As specialization, division of labor, and trade developed, individuals formed communities around the marketplace. What better process to actively engage the student in learning?

Electronic markets extend the Wesleyan campus and are incorporated in both introductory and upper-level economics courses. In the introductory course, Issues in Microeconomics, the economist's proclivity to reduce everything to market activity and place great importance to market prices is debated around the establishment of a futures market for the year 2000 U. S. Congressional elections.
The University of Iowa's Electronic Markets 2000 Congressional Control market opened for trading in January, 1999. As the market prospectus indicates, this market is based on the composition of the two houses of Congress following the November 2000 U.S. elections. The initial financial contracts traded in this market are:

RH_RS	Republican House, Republican Senate
RH_NS	Republican House, Non-Republican Senate
NH_RS	Non-Republican House, Republican Senate
NH_NS	Non-Republican House, Non-Republican Senate

Unit portfolios consisting of one share of each of the contracts are initially purchased for $1.00 by the participants. The liquidation value of the contract which represents the actual election results will be $1.00. All other contracts will have a value of zero.

Current quotes for the individual contracts are readily accessible, as is a price history in both graphical and tabular formats. One use my economics students made of this information was to predict short-term movements based on the U.S. Senate deliberations during the impeachment trial of President Clinton.

In Investment Analysis, an upper-level business course, portfolio competitions on the Internet offer a level of sophistication and convenience (and cash prizes) previously unavailable to both students and faculty. The commercial site, MarketPlayer, is a relatively new site that offers the attributes mentioned above, plus the ability to customize your own contest.

Traditionally, "stock market games" have been a very costly, labor-intensive process. Trading activity needed to be monitored, daily prices needed to be tabulated and/or plotted, and, of course, all this needed to be checked for accuracy. The percentage of the burden the faculty member placed on the student was a major factor in how many stocks (how diversified) the student had in her portfolio. Because we want to promote a long-term perspective, and thus diversification, having commercial sites minimize these costs is very beneficial. Typical features include stock charting, stock screening, trading activity, and the composition of competitors' portfolios.

There are, naturally, disadvantages as well as advantages to the MarketPlayer competitions. One disadvantage is its focus on short-term profits; the typical competition lasts only four weeks. While this does work against portfolio diversification, it does heighten the level of competitive energy. To topple a male from atop the "leader board," has turned out to be an important incentive at our woman's college.

An alternative to this "open" competition is to create a private competition for the class. Among the many variables that can be tailored to meet the objectives of a specific class are the ability to set the starting and ending dates, the ability to sell short or buy on leverage, the ability to place limit or stops orders, set maximum position percents (to encourage diversification) and commission levels (to encourage trading), and the ability to change interest rates to mirror the real financial markets.

The development of various electronic markets on the Internet and the increased presence of (commercial) websites have brought a new level of realism onto the college campus and into the college classroom. Students can now buy and sell in markets made competitive by thousands of participants and made realistic by the potential of real financial gain or loss.

Biology: Making Life a Little Easier by Doing the Impossible

Learning about life is best done through first-hand experience. This is especially true in biology, where hands-on laboratory experiments and field observations provide the best framework for understanding somewhat abstract and intangible theories. At first glance it might seem that interposing a computer between the student and the organism would necessarily distance the student for the process being studied. However, our goals in incorporating computers into biology instruction are to promote interactive instruction and to maximize student involvement in the learning process. The best uses which we have found for computers include simulations, direct data acquisition, imaging, statistics, graphing, and presentations. The settings for applying these approaches are the classroom, the instructional laboratory, the student/faculty research laboratory, and the field - including actual fields, off-campus educational facilities, and the students' own residences.

Creating a ubiquitous computing environment in the classroom and instructional laboratory allows students to sample a wealth of ideas, graphical images, and research results. For a small college, this kind of access is especially important, and has transformed parts of our academic program. The web provides access to the traditional scientific literature via extended library databases, such as Georgia's GALILEO system. These databases are expanding to include not only references, but also abstracts, and in some cases, entire texts of scientific research and review articles. Literature searches and reviews have become a central part of our intermediate and upper-level classes. Students in a recent general education anatomy class compiled a reference library of web sites containing human anatomy and histology pictures, explanatory texts, and tutorials, which far exceeded anything available in standard textbooks.

Computers can make learning about life easier in the teaching laboratory by replacing cumbersome, redundant, and onerous processes or steps. Modern computer-based technology can shorten learning curves by allowing students to focus on demonstrating theoretical relationships, formulating hypotheses, developing critical motor and mental skills, and designing experiments to test those hypotheses, rather than on wrestling with cumbersome, balky equipment. Students in our microbiology course use "Identibacter" (W.C. Brown) as a training short-course simulation and as a set of reference standards for bacterial identification. Exercises in animal physiology are based around "MacLab", a hardware/software system for multichannel physiological data collection and display. This system is so intuitive and easy to learn, that middle-school classes in our summer science camp can successfully record single nerve cell activity from cockroach legs or human EKGs from each other in a single 70 minute session. It is also so versatile, that I use it for my own research into dynamics of neuronal networks.

Computers can provide dynamic and interactive exercises that complement traditional, often static approaches. "Online Onion Root Tips" (Univ. of Arizona) is a web-based application which allows introductory biology students to sort multiple images of dividing cells into the appropriate mitotic stages, then test themselves on their performance. "Design-it-Yourself Glycolysis" (Univ. of Leeds) is another web-based application which allows students to work through glycolysis, testing alternative chemical reactions at each step while learning the correct sequence. Canary (Cornell Laboratory of Ornithology) is an inexpensive software application for sophisticated acoustical analysis, display and manipulation. In animal behavior labs we use Canary for identifying birds from our own field recordings. In our middle school science camp, we use it to illustrate basic properties of sound, graphical display, digital editing, and voice analysis.

Finally computers simulations can allow students to conduct experiments which time and resource constraints would otherwise make impractical or even impossible. We use the web-based "Virtual Flylab" (Cal. State L.A.) in introductory biology to help students learn and practice the rules of Mendelian genetics, via simulated fruitfly breeding experiments. Using FlyLab cuts the time for a standard two generation cross-breeding experiment from one month to as little as one minute. In the upper-level genetics course, Virtual FlyLab complements actually fruitfly breeding experiments, so that students understand both the simplicity of theory and the complexities of working with real animals. "EcoBeaker" is an example of a simple shareware application that performs ecology simulations, condensing large expanses of land and prohibitively long time periods into a computer screen and a few seconds or processing time.

Two central precautions are necessary when incorporating web access and computer use into biology instruction. The first is to apply computers only where they actually make life easier. They should simplify, not complicate data collection and analysis. Computer simulations should complement, not replace physical/mechanical simulations and actual experiments on real organisms. A second, and more critical, precaution concerns the ease of access to "information" on the web. As web use becomes ubiquitous, it is increasing important to give students early training in the difference between a personal web page and a peer-reviewed primary research article; to encourage them to be appropriately selective, discriminating, and critical about what appears on their computer screens.

Summary

Our guiding principle is that learner-centered, interactive approaches have a natural affinity with instructional technologies. Integral to the success of a program like Wesleyan's is that individual faculty have control of the use of technology. Faculty and students recognize the freedom to make mistakes and experiment in and out of the classroom. This climate fosters bi-directional learning and collaborative research between students and faculty.

Resources and Internet Web Sites

Performing the Past
http://www.wesleyan-college.edu/academics/studentprojects/memoryhome.htm

Iowa Electronic Markets
http://www.biz.uiowa.edu/iem/

MarketPlayer
http://www.marketplayer.com/

Virtual FlyLab - web-based fruit fly genetics lab
Electronic Desktop Project - http://vflylab.calstatela.edu/

EcoBeaker - ecology & population dynamics simulations
Eli Meir - ecobeaker@zoology.washington.edu

Canary - acoustical analysis
Cornell Laboratory of Ornithology, Cornell University

NeuralSim - neuronal membrane potential simulations
K.R. Newton & R.J. Bookman, University of Miami

MacLab - multichannel electrophysiological data collection
CBSciences, Inc. - info@cbsci.com

INTERNET AND WIDE AREA NETWORK, A STUDY OF COURSE AT DEKALB TECHNICAL INSTITUTE

Amit Dave
Computer Information Systems
Dekalb Technical Institute
16200 Alcovy-Jersey Road
Covington, GA 30044
(770) 786 9522 ext. 3214
davea@admin2.dekalb.tec.ga.us

INTRODUCTION:

This particular study reflects the course curriculum for CIS 156 we have adopted at our institution. We have begun offering this course hoping the students and staff members will benefit from the ever-fascinating Internet. The course emphasizes on various Internet related details. Although approximately 85% students in this class are CIS majors, there are few from various other programs also enroll in the hope of acquiring expertise in Internet. The course is offered as an elective.

COURSE OUTLINE:

CIS 156
INTRODUCTION TO THE INTERNET AND WIDE AREA NETWORKS

CREDIT HOURS: 5 Class Hours: 20 Lab Hours: 60 Total Hours: 80

PREREQUISITE: Introduction to Microcomputers (SCT 100)

DESCRIPTION: This course is designed to explore, navigate and understand the Internet and related wide area networks. The student will learn how to connect a PC to the Internet as well as how to use communications software to access the many resources available on the network. Topics include: network fundamentals, Internet concepts, electronic mail, TCP/IP, FTP (file transfer protocol), Telnet, HTML coding, and JAVA programming language.

OBJECTIVE: Student will learn how to connect a PC to the Internet, as well as how to explore the resources of Internet.

MAJOR TOPICS:

I. NETWORK FUNDAMENTALS

  A. Wide Area Network
  B. Modems
  C. Modem Installation

D. Communication Software

II. INTERNET CONCEPTS

A. Purpose
B. Internet Protocol
C. Protocol Standard
D. Internet Applications
E. Domain Name System
F. Internet Resources

III. ELECTRONIC MAIL

A. Mail Servers
B. Sending/Receiving Message
C. Online Directory Databases
D. Network Email
E. Electronics

IV. FILE TRANSFER PROTOCOL

A. Downloading/Uploading
B. Anonymous FTP
C. Remote Computer Systems
D. Archive Sites
E. File Translation
F. Filename Extensions

V. TELNET

a. Purpose
b. Telnet use
c. Telnet Commands
d. Troubleshooting

VI. INFORMATION SERVICES

A. Information Retrieval
B. Subscribing/Unsubscibing
C. Regional Networks

STUDENT COMPETENCIES: At the completion of the course, the student will:

I. NETWORK FUNDAMENTALS

A. Compare and contrast various wide area network technologies.
B. Describe the advantages and disadvantages of different WAN.
C. Install and use communication software.

II. INTERNET CONCEPTS

A. Explain the purpose and scope of Internet.
B. Describe IP address.
C. Identify the protocol standard used on the Internet.
D. Describe the resources available on the Internet.

III. ELECTRONIC MAIL

A. Describe mail server purpose and operation.
B. Concept of Email
C. Recognize and troubleshoot Email error messages.
D. Participate in electronic discussion.

IV. FILE TRANSFER PROTOCOL

A. Download and upload a file.
B. Use anonymous FTP.
C. Locate files on the remote computer systems.
D. Translate a file from one format to another.
E. Identify common filename extensions used with various operating systems and file utilities.

V TELNET

A. Describe the purpose of the telnet function.
B. Establish a connection with remote computer.
C. Use various Telnet commands.

VI. INFORMATION SERVICES

A. Retrieve information from the variety of services and databases located on the Internet.
B. Subscribe and unsubscribe to various services on the Internet.

TEXT: The World Wide Web Featuring Netscape Navigator, Illustrated Standard Edition, by Barker/Barker.

The course outline reflects the technical nature of the course, which we try not to emphasize as the class contains students from other non technical areas too, instead our approach is to be more general without ignoring the fact that certain technical issues will have to be discussed.
The course integrates network fundamentals along with Internet related concepts, which at times do include technical issues. Students from non-technical background have shown their concern about this issue, but we concluded that, it is important for us to discuss these technical issues to thoroughly familiarize the students.

To further improve the effectiveness of the class we conducted the survey. The survey includes students who have taken this class and those who plan to take this class in future. Result of the survey is as follows:

Almost 99% students want Dekalb Tech to offer this class.

There was a 55 to 45 ratio about technicality of the class with 55% students wanted the class to be less technical and 45% wanted the class to be very technical.

Approximately 85% students showed their willingness to learn JAVA and HTML programming. 100% of these students are majoring in either Computer Programming or Microcomputer Specialist.

Approximately 78% students expressed their desire for Dekalb Tech to offer the class online.

Opinions varied while deciding the prerequisite for the class. Almost 100% CIS majors wanted Networking fundamentals a mandatory requirement for the class whereas only 35% non-CIS majors thought that networking background is essential.

RECOMMENDATIONS:

1) It was recommended after the survey and discussion with the student body, and administration, that the class should be of non-technical nature, although technical issues will still be discussed whereever necessary.

2) Efforts are underway to make Networking Fundamentals a prerequisite for the class.

3) My colleague Mr. Roger Lignugaris has developed a separate course in JAVA programming. Georgia Department of Adult and Technical Education approved grant for Mr. Lignugaris for this purpose. The course will be offered in fall 1999.

4) Another course on HTML programming has also been proposed. If approved, we'll be offering it in fall 1999.

Web Tools for the New Millenium

Daniel T. Doles
Network Manager
Franklin College of Indiana
501 East Monroe Street
Franklin, IN 46131
Voice: (317) 738-8151
e-mail: ddoles@franklincollege.eau

Introduction

The phrase "You get what you pay for" is often times appropriate and applies to a myriad of situations. However, the world of open-source[1] software is definitely an exception. Based on the premise that programmers can read, modify and redistribute the source code for a given software application, open-source tools are rapidly spreading to new markets every day. Included in the vast library of open-source software are a number of powerful tools for the World Wide Web.

Among the available open-source web tools is Apache, the most widely used web server on the Internet today. Use of the HTML embedded scripting language PHP has grown immensely in just the last year. Another powerful open-source tool is the multi-user, multi-threaded SQL database server MySQL. In fact, a large portion of the "guts" of the Internet, including mail transports, web servers and FTP servers are open source.

The Open Source Concept

The open source concept is based on a fairly simple idea. Give programmers the ability to read, modify and redistribute the source code to a piece of software and it will evolve and improve. In fact, compared to the closed, commercial model where only a few programmers have access to the source code, open-source software can develop at an amazing rate.

However, the notion of open source goes beyond free distribution and access to source code. There are specific distribution terms an open-source program must meet. These terms are outlined on the Open Source web site at http://www.opensource.org in the Open Source Definition and address such areas as derived works, integrity of the author's source code, discrimination against persons, groups and specific fields of endeavor and contamination of other software. Open Source has even been made a certification mark that can be applied only to software meeting this definition.

What about security and support concerns? The open-source community makes a strong argument that mature open-source software is both more secure and reliable than closed source software. The belief that closed source protects against hacking is somewhat misleading and tends to create a false sense of security. A highly motivated hacker will find security holes whether source code is available or not. Closed source also prevents users with good intentions from fixing security holes when they are discovered. Trustworthy fixes to closed source operating systems are usually harder to distribute as well. From a support standpoint, the rapid evolution of open-source software tends to make it more reliable. And when support is required there are far more resources available and at a much cheaper cost.

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[1] Open Source is a trademark of the Open Source Initiative.

Tool Set

Apache Web Server

Apache is a robust, full-featured, open-source implementation of the HTTP protocol. According to the January 1999 WWW server site survey by Netcraft[2], more than 53% of the web sites on the Internet are running Apache. It is most prevalent on the UNIX platform but has been ported for use in the Windows environment. Apache is based on code and ideas from NCSA httpd 1.3. The project is managed by the Apache Group, a worldwide group of volunteers that use the Internet to plan and develop the software and its documentation.

The Apache web server is highly configurable and packed with features. The Apache module Application Programming Interface (API) can be used to create custom modules. Administrators can create files or CGI scripts to provide customized responses to problems or errors. Multiple directory index directives are supported in Apache as well. For example, a directive can be defined that will return either index.html or index.cgi, whichever is found, when a request for a directory URL is made. Apache is also capable of serving a variety of browsers with different levels of HTML compliance and sophistication.

Support for Apache is provided via a pair of newsgroups, comp.infosystems.www.servers.unix and comp.infosystems.www.servers.ms-windows. Apache source code can be downloaded from the Apache HTTP Server Project web site at http://www.apache.org. Binary distributions, server documentation and an FAQ are available from this site as well.

PHP: Hypertext Preprocessor

PHP is an HTML embedded scripting language used to create dynamic web pages. PHP pages can be created and modified in the same manner as regular HTML documents. Perhaps the best way to describe how PHP works is with an example. Consider the following HTML code:

```
<html><head>
<title>PHP Sample Code</title>
</head><body>
<?php echo "Hi there<P>"; ?>
</body>
</html>
```

When viewed by any browser, this page simply displays the phrase "**Hi there**" and nothing else. While this page can be produced without the use of PHP, it does demonstrate the simplistic embedded nature of PHP. The "<?php" is the start of a PHP tag. The "?>" is the end of the PHP tag and indicates an exit from PHP mode. An HTML document may enter and exit PHP mode as many times as necessary.

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[2] http://www.netcraft.com/survey/

In addition to creating dynamic web pages, PHP can be used to create GIF image files and GIF image streams. PHP must be compiled with an additional library of image functions in order to take advantage of this feature. PHP also provides file upload support. Used in combination with the set of authentication and file manipulation functions, PHP allows you to exert full control over who can upload files and where those files are stored. PHP also provides native mode and ODBC support for a number of databases including dbase, mSQL, MySQL, Oracle, Sybase and many others.

Like Apache Web Server, PHP was developed for the Unix platform and has been ported to the Windows environment. Downloads, a brief tutorial, on-line documentation and more is available from the PHP web site at http://www.php.net.

Projects

Searchable E-mail Directory

The initial project developed at Franklin College using these open-source tools was a searchable Faculty and Staff electronic mail directory. The program allows any visitor to the Franklin College web site (http://www.franklincollege.edu/) to locate e-mail addresses for all Faculty and Staff. The directory can be searched and displayed either alphabetically or by department. In addition to e-mail addresses, the directory contains telephone and URL information where available and applicable. Currently, the information is maintained in a separate Access database. Future revisions of this project will expand the available information included in the directory and interface with existing data sources in order to eliminate the need for a separately maintained database.

Personal Web Page Index

Another project developed using PHP scripts is an index for student, faculty and staff personal web pages. During the fall semester of 1998 server disk space was made available for the first time to students for the purpose of creating their own web pages. This index application provides both a single point of access to all personal pages and a search tool for visitors to the Franklin College site to use in locating a particular personal page. The top-level page of this index is also a prime spot to include an official disclaimer statement. The *Personal Web Page Index* is quite similar in functionality to the *Searchable E-mail Directory* and also uses an Access database. It is conceivable that the two applications will eventually be merged into one.

Lab Reservation System

A system for reserving campus computer labs has been in existence at Franklin College for nearly a decade. The original version was written in BASIC by a senior Computer Science student and ran on a Micro VAX II under the VMS operating system. In 1995 the program was rewritten for the Windows environment using Visual Basic. This version expanded the function of the system by including other computer resources such as our computers on wheels, also known as COWs.

Using PHP another version of the *Lab Reservation System* was developed to run on the Franklin College Intranet site. This web-based version has been generalized to encompass non-computer resources such as various conference rooms and audio-visual equipment. It also includes some enhanced features such as the ability to reserve a resource for the same time every week for up to

15 weeks. The new system also allows an instructor to cancel his or her own reservations, a function which, in previous versions, required administrator intervention.

List of Lists

The most simplistic project developed in PHP at Franklin College is the *List of Lists* application. It simply provides the user community with an on-line list of distribution lists that have been created on the e-mail server. The application allows the user to select a specific distribution list and then it displays the individuals that are on that list, complete with "mailto:" links to both the list itself and the individuals on the list.

Perhaps a better understanding of how PHP works can be derived from an examination of the code for this application (shown below). You will first note that the program is, for all intents and purposes, a simple if-then-else statement. The key variable is "**sel_lst**". This is the name assigned to the selection box in the "else" clause. The action "$PHP_SELF" specified in the "<form>" definition in the "else" clause instructs PHP to call this same file or program when the "Select" button is clicked. The "if" clause simply queries the database and displays the selected distribution list. It should also be noted that the large number of "echo" statements eliminates the need to jump in and out of PHP mode.

```
<? /* List of Lists */
        $result = odbc_connect("email","","");
        echo "<body background=/lol/blu-gry_white_bk.gif link=#6699FF vlink=#6699FF>\n";
        echo "<table border=0>\n";
        echo "<tr><td WIDTH=130 HEIGHT=71><a href=http://bravo.franklincoll.edu/><img
                src=/lol/logo_small.gif border=0></a></td>\n";
        echo "<td><img src=/lol/pixel.gif></td>\n";
        echo "<td><font color=#004080 size=+3><b>List of Lists</b></font><br>\n";
        echo "<img src=/lol/contents_line.gif width=160 height=2></td></tr>\n";
        echo "<tr><td WIDTH=130 HEIGHT=30><IMG SRC=/lol/pixel.gif></td><td></td>
                <td></td></tr>\n";

        if ($sel_lst != 0) {
                echo "<tr valign=top><td><a href=$PHP_SELF><font color=#FFFFFF>List of
                        Lists</font></a></td>\n";
                echo "<td></td>\n";
                $slct = "select listname,listdesc from lists where lidx=$sel_lst";
                $get = odbc_exec($result,$slct);
                $fetch = odbc_fetch_row($get);
                $lst_nam = odbc_result($get,"listname");
                $lst_des = odbc_result($get,"listdesc");
                echo "<td><table border=0>\n";
                echo "<tr bgcolor=#FFFFCC align=center><td colspan=3>\n";
                echo "<font color=#004080><b>".$lst_des." (<a href=mailto:".$lst_nam.">\n";
                echo $lst_nam."</a>)</b></font></td></tr>\n";
                echo "<tr align=center><td bgcolor=#004080><font color=#FFFFFF>Name
                        </font></td>\n";
                echo "<td>&nbsp;&nbsp;</td><td bgcolor=#004080><font color=#FFFFFF>
```

```
            Department</font></td></tr>\n";
        $slct = "select efacstaff.emailaddress,efacstaff.lastname,efacstaff.firstname,
            department.desc from ";
        $slct .= "efacstaff,jointab,department where jointab.lst=$sel_lst and
            jointab.mem=efacstaff.id and efacstaff.dep=department.idx ";
        $slct .= "order by efacstaff.lastname,efacstaff.firstname";
        $get = odbc_exec($result,$slct);
        while ($fetch = odbc_fetch_row($get)) {
            $nam = odbc_result($get,"lastname").", ".odbc_result($get,"firstname");
            $add = odbc_result($get,"emailaddress");
            $hrf = "<a href=mailto:".$add.">".$nam."</a>";
            $dep = odbc_result($get,"desc");
            echo "<tr><td>".$hrf."</td><td></td><td>".$dep."</td></tr>\n";
        }
        echo "</table></td></tr>\n";
    } else {
        echo "<tr><td></td><td></td><td>\n";
        echo "<form action=$PHP_SELF method=POST>\n";
        echo "<table border=0>\n";
        echo "<tr><td align=right>List:</td>\n";
        echo "<td><IMG SRC=/lol/pixel.gif></td>\n";
        echo "<td><select name=sel_lst>\n";
        $slct = "select * from lists order by listdesc";
        $get = odbc_exec($result,$slct);
        while ($fetch = odbc_fetch_row($get)) {
            $cod = odbc_result($get,"lidx");
            $lst_nam = odbc_result($get,"listname");
            $lst_des = odbc_result($get,"listdesc");
            echo "<option value=".$cod.">".$lst_des." (".$lst_nam.")\n";
        }
        echo "</select></td></tr>\n";
        echo "<tr><td align=right><INPUT TYPE=submit VALUE=Select></td>\n";
        echo "<td><IMG SRC=/lol/pixel.gif></td>\n";
        echo "<td><INPUT TYPE=reset VALUE=Reset></td></tr>\n";
        echo "</table></form></td></tr>\n";
    }
    echo "</table></body>";
?>
```

Conclusion

PHP and Apache are constantly evolving and improving, as are numerous other open-source applications. These tools provide powerful and inexpensive resources for building dynamic web sites. Furthermore, as they grow, so too will the mechanisms and resources for supporting them. So don't let the word "free" scare you away. Just because something is free does not always mean it lacks value.

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Current and Future Trends In Information Technology: Findings in the State of Florida

Shirley Fedorovich, Associate Professor
Sharn Vericella, Graduate Student
Embry-Riddle Aeronautical University
Business Administration Department
600 S. Clyde Morris Boulevard
Daytona Beach, Florida 32114
904-226-6685
fedorovi@db.erau.edu

"A great way of predicting the future is to invent it."

Walter Rodriguez
Florida Gulf Coast University

Introduction

Once a year a University in the State of Florida hosts the FLORIS conference. This year the Conference was hosted by Embry-Riddle Aeronautical University, in Daytona Beach, Florida, and co-hosted by Barry University of Miami, Florida. The FLORIS conference is where professors of Information Technology in the State of Florida get together to discuss such issues as research, teaching, and curriculum. In addition, leading practitioners present information on the current and future trends within the IT industry. The Conference offers the opportunity for an informal setting for professors to share and exchange ideas with as well as hear important information from business professionals. This year, the keynote speakers were from IBM and SAP America, with additional representatives from Anderson Consulting and IBM. Other presenters were from various universities in the State addressing issues such as, education, research, distance learning, and web-based curriculum. This paper will summarize the trends these professionals presented, plus provide additional information from current literature that supports the trends presented at this conference.

Electronic Markets

E-Commerce may be defined as the buying and selling of information, products and services via the Internet. *The Rise of the Electronic Community* (Champy, Buday, and Nohria), discusses how to capitalize on the enormous opportunities that electronic communities offer and how to deal with the threats they present. Electronic communities, or Internet-based businesses, are constructed so that consumers can purchase homes, cars, a college education, plan vacations, and find jobs, etc. The key to successfully capitalizing on electronic communities, is for managers to understand the concept of consumer processes (collection of steps that people go through to achieve a goal), and the fundamental ways that on-line technology transforms them. "The power of a global, interactive computer network lies in transforming the means by which consumers satisfy their critical desires." Today's technology allows managers to rigorously examine the end-to-end tasks of their customers. Managers can use the Internet to transform those tasks and to redesign consumer processes (Champy, Buday, and Nohria).

The authors discuss how the consumer process may be defined in a few fundamental steps. The first step is the need to acquire relevant information to make sound decisions, such as, discovering alternatives, prices at which products/services are offered, and the quality of those products/services. The second step is the need to communicate with providers of goods and services through the Internet. The third step is networking with others with similar needs or experiences. In the world of global networks, networking takes on a whole new dimension because time and geography constraints are now non-existent.

The fourth step is to use appropriate sensory input, such as sight and sound, to arrive at a purchasing decision. For example, car buyers will one day take an automobile for a test drive far beyond a dealership. It is also important to have the things one needs at the time and place one needs them. For example, sports fans no longer have to wait for tomorrow's paper to get the box scores on tonight's games. The last step is to tailor one's products to the individual's needs, rather than creating them to be "one-size-fits-all."

Cyberspace presents opportunities for managers developing the technology infrastructure and sticking to or creating one's product niche, while redefining performance standards.

The Effects of E-Commerce in the Airline Industry

As one airline executive was recently quoted, "Further gains in cost performance require E-Commerce as the foundation." The following are technology trends, which will in one shape or another, affect the Airline Industry as a whole. Our fast paced society will continue to demand instantaneous results, and there will continue to be an ever-growing demand for innovations such as digital TVs, and wireless home securities. The bandwidth revolution is greatly increasing data communications, and self-service solutions will abound in the form of e-tickets, e-ticket machines, e-timetables, and gate readers.

Mr. Steve Cossette, Vice President of Distribution Planning for Continental Airlines, has stated that the following trends are expected in the Airline Industry: By the year 2002, approximately 40 percent of the airline business is expected to be through direct channels (up from the current penetration rate of 20%); A higher emphasis will be placed in marketing direct services to customers as airlines recognize the value of implementing self-service solutions such as E-Ticket machines, electronic timetables, and gate readers. The rapid growth of E-Commerce and worldwide adoption of E-tickets will play a role in the consolidation of travel agencies.

Mr. Cossette then discussed Continental's Self Service Strategy and E-Ticket Enterprise Plan. The goal is to empower the customer by providing for self-service elements. Travel arrangements can be done internally through Continental's speech recognition system, or externally via on-line systems through the Internet. An e-ticket can be sent by fax or e-mail, then received from an e-ticket machine and displayed to a gate reader. During flight, other flight reservations may be made for free using Continental's GTE Airphones, and during post-flight, speech recognition facilitates changes/reissues, refunds, or baggage claims via electronic ticket machines.

The **vision** of Continental's Travel Distribution department is: *True Electronic Commerce is enabled by Electronic Ticketing and the Internet, which together establish the basis for new business relationships.* Mr. Cossette concluded his presentation with this quote: "By leveraging e-commerce technology, airlines can now develop closer relationships with travel agencies and corporations". Similar trends are expected at other airlines. Students need to be prepared to work with this kind of application of technology.

E-Commerce and Other Markets

Author Yannis Bakos, notes that recent years have seen a dramatic increase in the role of information technology in both traditional markets, and in the emergence of electronic marketplaces. An example is the multitude of Internet-based online auctions. In particular, Bakos says that managers must be able to understand the different function's that make markets work. Functions may include matching buyers and sellers, facilitating the exchange of information, goods/services, and payments associated with market transactions. Managers must also know how to manage technology, and more importantly, not to use technology, just for the sake of technology. Internet-based electronic marketplaces are still at a formative stage, therefore, education serves a major role as the link between understanding the nature of markets, and understanding how to manage technology.

IBM has established a division within their organization called E-Business. Ms. Pat Moesinger gave a presentation at the FLORIS conference on some of the features E-Business has to offer IBM customers, which helps demonstrate the direction where IBM believes e-commerce is going. This information is important to educators to help understand where the emphasis of the education of information technology might be directed. In early 1998, the web was primarily used for e-mail applications, to a lesser extent publishing information, and remotely used for customer service Today, the Internet is being used to support many key business processes. The implication for educators is the need to focus on how information technology can reengineer business processes to provide suitable solutions to meet corporate needs.

Today, Intranet and Extranets represent the fastest growing areas of the Internet. Intranets give corporations the ability to connect all their employees together for communication and information publishing needs. More importantly, the Intranet helps eliminate the problem of individual department solutions. More collaboration within all departments of the company becomes possible when everyone is connected together. The dissemination of information is also faster and more reliable.

Extranets are the fastest growing segment of the Internet today. This technology allows business to business relationships to exist over the Internet. For example, a company can interact with their suppliers, customers, banks, and investors at the same time. The Banking Industry has been one of the first industries to really embrace the concept of E-commerce with online banking. For a nominal fee, one can obtain all the pertinent information about his/her account, and even have some monthly bills paid by the bank. Some banks are offering this service free of charge to their customers.

The Chrysler Corporation is another example of a business using reengineering as a key process operating off the Internet. Approximately 80 percent of their parts come from someone else, with

a reported billion dollars slashed from their operating costs from using the Internet. Chrysler splits the profit from the cost savings with their suppliers.
Today, many companies are realizing the value in e-business relationships. The manufacturing industry has reduced costs almost 75 percent, travel 15 percent, insurance $600,000 per year, and telecommunications companies $2.5 billion per year. The primary uses of the Internet today have been to provide database access (68%), customer service (47%), inventory management (53%), commerce (44%), and publishing (21%) (Moesinger).

The trend in most businesses that use the Internet is to, "start simple and grow fast." The first step is to establish a web site. The second step is to allow transactions on the core system by identifying core business processes and building e-business applications. The third step is to improve and redefine core processes that are scalable, responsive, safe, and reliable. Lastly, it is important to leverage knowledge and information one has gained through e-business systems.

Boeing has reengineered their spare parts business, which generates about $1.2 billion per year. An airline can get online to locate any aircraft part and know immediately the availability, shipping, and price of the part. This process not only eliminates errors, but also gives the customer an immediate response. Any Boeing customer has access to this system to determine price, availability, and order status of any account. This is an example of an e-business solution to reengineering a major process.

A key component to the e-business framework is Java. There are about one million Java programmers, with over 400 universities offering Java. By the year 2002, it is estimated that 70 percent of all e-business applications will be written with Java. This trend indicates the growing need for models to be flexible, everywhere, and accessed anywhere at anytime. It is predicted that there will be Java enabled clients, systems, and backends (Moesinger).

The implication for educators today is that the Internet has become a powerful tool for organizations to conduct business. The reengineering of business processes to use the Internet to conduct business needs to become a part of the learning process.

An interesting site for future trends in IT is IBM's AlphaWorks. This web site was originally created to present IBM's hottest Internet technologies for research. Today, this site is a focal point for providing early adopters access to technologies from IBM's top researchers and developers. IBM also uses this site to gather feedback from users and interested people to incorporate their ideas back into the technologies. This is also an excellent opportunity for potential research opportunities. IBM also uses this site to identify innovative developers, researchers, and technology decision-makers that would like the chance to work directly with IBM's researchers and developers through the discussion forum of IBM's new product development. This is clearly an example of "bleeding-edge" Information Technology.

Strategic Alliances

SAP America is the world's largest enterprise software company, with approximately 36 percent of the market share for Enterprise Application Software. By collaborating with business IT executives and partners worldwide, SAP has developed a unique understanding of the challenges facing implementing technology solutions.

SAP's University Alliance program was developed to help universities offer application's of Information Technology from a business viewpoint. The program is only two years old, but already has roughly 100 members. SAP helps schools develop graduate and undergraduate curricula to understand the whole system. The ERP (Enterprise Resource Planning) systems were developed by a network of university researchers that contribute to the body of knowledge and innovative applications of the software.

SAP's software integrates the entire organization's functional departments together to optimize the business functions so more accurate management decisions can be made. There is a module for each business function such as, human resources, operation management, and financial systems, etc., which is designed to integrate the functions together, add value to each function, and add value to the entire business.

SAP presents a good opportunity for universities to teach applications of information technology and resource planning from a whole system viewpoint, especially an Information System that was created by university professors. This system also presents an excellent research opportunity for the application of resource planning in curriculum and organizations because SAP requires the integration of concepts and technology into the discipline, not the teaching of SAP.

Strategic alliances are important for the survival of most small schools today. An alliance may provide a means for schools to acquire hardware or software, jobs for graduates, internships or cooperative positions, or about anything that will help align the school with industry. Collaboration inside and outside the organization is also important for both industry and universities. For example, Boeing collaborated with many companies before building their 777.

Embry-Riddle is an example of a university with alliances. We have an alliance with IBM for hardware, Kennedy Space Center and Lockheed Martin to collaborate on several projects used with our graduate courses, and Columbia University for offering a meteorology course. Within Embry-Riddle, we have the ICE program, Integrated Curriculum in Engineering, designed for faculty to work together from three different departments to offer courses in aerospace engineering, computer science, and humanities. These are just a few examples of our alliances.

East Carolina University has partnership opportunities available within their construction management and industrial management departments. The State of Iowa has established partnerships between their economic development, education, and workforce development departments with the Iowa Association of Business and Industry. They also have developed a school-to-work partnership. Oracle sponsors a web site, MirandaNet, that introduces teachers and lecturers to new ways of teaching and learning. MirandaNet is sponsored by several organizations, including Apple, BBC Education, and Oxford University Press, who are involved in joint projects focusing on the impact of advanced technologies on teaching and learning.

The trend in higher education is to collaborate, cooperate, or collapse. Most schools and Industry representatives agree wholeheartedly on this issue.

Distance Learning

A trend that has marked the last few years in education, is for more and more schools to offer Distance Learning programs. For example, Embry-Riddle has an extended campus in over 100 locations around the world. It's Center for Distance Learning (CDL) is an integral part of the Extended Campus with close links to the College of Career Education (CCE). The CDL was established in July of 1980, in response to the realization that even the rapidly growing number of CCE resident centers in the U.S. and abroad, would never be able to reach everyone who had an ambition for higher education degree programs in Aviation and Aerospace related fields.

Some prospective students lived in small communities where establishment of a resident center was not feasible. Others lived in isolated areas around the world, and worked in professions where the word "schedule" had no real meaning. The Center for Distance Learning was developed to extend to these people the opportunity to complete an Embry-Riddle degree at their own locations and their own schedules, but still continue to adhere to all University requirements.

Other universities and corporations, want to capitalize on the opportunities that Distance Learning programs offer. One such corporation is Raytheon. Raytheon Training is currently delivering Interactive Distance Learning solutions for a master's degree program in instructional technology throughout the U.S. via computer conferencing. College-level courses are taught through live and taped satellite transmission to secondary schools and other institutions of higher learning. Raytheon has already implemented Interactive Videoconferencing systems for the Universities of Alabama, Florida, Maryland, Tennessee, Northern Virginia Community College, the Western Kentucky Educational Cooperation, and Nebraska's statewide Educational Telecommunications Network.

Another example of a University that has engaged in Distance Learning is the University of Washington (UW). Most UW distance learning courses are designed by faculty that teach the same courses on the University of Washington's campus. The instructors are familiar with student questions and needs, and with the help of instructional designers, have developed the appropriate materials and methods to help students achieve the course objectives in a distance learning format.

Typically, distance leaning programs can help students earn credit toward an undergraduate degree, fulfill deficiencies through additional course work, fulfill continuing education requirements, and complete certificate programs.

Presently, many schools are offering a wide variety of distance learning programs through the Internet. For example, there are those schools that offer on-line degrees for just $7.95 per course, and more traditional schools such as Harvard and Wharton that also offer on-line degrees.

Web-Based Curriculum

Web-based curriculum is another trend in higher education that can create a major impact on dollar savings for a school. Many schools are encouraging faculty to use the web for some, if not all of the material in some of their courses. Embry-Riddle hired a team of information technology professionals (IT team) to develop a web-based template for faculty to use to help standardize the format of the web-based courses. Having a template not only standardizes the course format, but saves faculty large amounts of time to convert course material to web-based curriculum.

ERAU found that faculty are more willing to convert all or part of a course to this format when there is a template that is easy to use and understand. Some of the components of Embry-Riddle's template are Introduction, where basic information about the course is stored, Schedule, where the course syllabus is located, Media Center, for the contents of the electronic library, Lectures, for the actual course content, and Course Room, for content discussions between the students and/or Instructor. There are also several publishing firms that have developed templates that can be used by schools when their textbooks are adopted.
The biggest problem with web-based technology is the E-mail "nightmare." The tremendous amount of E-mail that Instructors receive can be quite overwhelming. One professor that had responsibility for introductory computer courses online, received about 140 messages a day. The classes were large, but no larger than could be taught by one Instructor in the traditional classroom. This has been a constant complaint of professors conducting courses online. Having a course room or chat room portion of the course does seem to help. Embry-Riddle provides help to faculty by offering faculty training camps, and an IT team that helps load all the course information into the template.

There are many combinations of uses with the web-based curriculum concept. Courses can be completely contained on the web so students never have to meet formally as a class. A class can meet for one or two sessions to acclimate the students to the web-based system, or a class may meet as a traditional class with part of the information being on the web, such as the syllabus and supplementary material. In addition, using this delivery method enables a course to be designed to be self-paced. Students can sign-up to take exams whenever they want. After they have completed the material and exams, students are finished with the course.

ERAU has developed a wide variety of courses, at different levels in the curriculum. There does not seem to be any courses that cannot be offered using this technology. Some students like this delivery method because of the flexibility in time to learn the material, and the material may be viewed on their own timeframe, but other students would prefer the traditional delivery method. Some schools are offering the same course in both delivery formats and the student registers for the method of instruction they want.

The implication of web-based curriculum is that it does provide a tremendous cost savings for schools, and many schools are encouraging (or requiring) faculty to develop web-based courses. However, many faculty are reluctant to pursue this technology because of the time commitment and lack of knowledge in web-based development.

Conclusion

The implication of these trends is that education needs to approach information technology from a business process application, not just to teach technology for technology's sake. Students need to understand how technology can add value to an organization. E-Commerce is playing a significant role in reengineering business processes. Students need to be aware of this and how it applies to information technology.

Universities and their faculty need to seek out alliances to help remain competitive. Distance Learning can help tap the nontraditional student market and generate additional revenues. Web-based curriculum can provide cost savings to a University and provide students with an alternative method of taking courses.

More research is required to provide much needed information on how to refine delivery methods and for development of tools necessary to teach in each of these areas.

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THE MANAGEMENT OF DEVIANT BEHAVIOR IN THE VIRTUAL CLASSROOM

Tim Garner
Director of Institutional Research and Associate Dean
Franklin College
501 East Monroe Street
Franklin, IN 46131
317-738-8093
garnert@franklincoll.edu

Introduction

The introduction of any new or emergent technology into a social system is bound to produce consequences that are both intended and unintended; foreseen and unforeseen. Consider, for example, the growth in popularity of collaborative learning strategies and techniques. The purported benefits of said strategies have been widely publicized, workshops and other professional development activities offered, research conducted to assess outcomes, etc. Teachers have thereby been encouraged to integrate group-based learning activities within the context of their teaching and rewarded for their efforts in that direction. Not surprisingly then, the adoption of collaborative learning has grown and moved in the direction of becoming an institutionalized feature of higher education.

Of course, those who have been involved in this particular evolution (or paradigm shift, if you will) within higher education might note that a much less recognized feature of this process was not mentioned in the preceding paragraph. In my academic discipline, we would refer to it as "cultural lag," meaning that a social system needs time to catch up, so to speak, to the matrix of consequences wrought by an emergent technology in its midst. The human capacity to innovate technologically inexorably outpaces our ability to adapt socially and psychologically (not to mention politically, economically, spiritually, and philosophically) to the changes brought about by the technologies we create and utilize. Thus, teachers venturing into the new frontiers made possible by the technology of collaborative learning often discover a number of challenging "side effects" in addition to the advertised benefits.

As a proponent and veteran practitioner of collaborative teaching and learning, it is not my intent to describe the challenges associated with collaborative teaching and learning, but rather to establish a more familiar context from which to approach my musings about virtual teaching and learning. In other words, we have been through this before, so let's not lose sight of what we have learned from previous iterations of the same process.

I've conducted workshops for teachers who have been sold on collaboration in the classroom only to discover that actually "doing it" was not always quite what they had expected. Hopefully, the analogy is quite obvious for the purpose of this presentation. Adding an on-line environment to your classroom without anticipating a variety of potential behavioral outcomes is analogous to configuring your class into semester-long learning groups without adequately taking into account how this new arrangement will provide the potential not only for new benefits, but also for new challenges. Offering a class exclusively through computer-mediated means could arguably raise the bar of expected change and behavioral consequence to an even higher level.

The reader should be aware that my biases with respect to the utilization of "information technology" as a feature of teaching and learning environments are derived, in part, from my own extensive ethnographic research on virtual communities and computer-mediated interaction. My experiences as a system administrator for a number of on-line virtual communities have also served to shape my perceptions of the uses of computer-mediated interaction as a teaching and learning tool. Lastly, I have utilized both synchronous and asynchronous on-line technologies in my own classes. Simply stated, I am an enthusiastic proponent of the potential that computer-driven technologies offer us as teacher and learners. However, my enthusiasm is framed by a concern that the rapid evolution and proliferation of said technologies presents us with significant challenges. These challenges will try our individual and collective abilities to anticipate, understand, and adapt to the consequences brought about by the use of these same technologies.

Deviant Behavior in Learning Environments

Deviance is an illusive concept given that what might be considered deviant in one classroom may be viewed as normative and desirable in another. Perhaps the most useful way to approach this issue is to simply acknowledge that each classroom will develop its own definitional context for sorting out behaviors that are deviant from those that are not. Given that caveat, we can construct a general conceptual frame for classroom deviance that includes those behaviors with the potential to disrupt or compromise the creation and/or maintenance of an environment conducive to learning. Of course, this "definition" sidesteps more serious issues that lay at the root of understanding deviance such as who has the power to define what is right and what is wrong. For the purposes of this paper, it is sufficient to establish that the potential exists in every classroom for the emergence of behaviors that can be counterproductive to the learning process.

Virtual classroom components such as bulletin board systems, chats, and e-mail discussion groups as well as stand-alone virtual classrooms provide us with challenges to the effective management of deviant behaviors that are identical in some ways to the traditional, face-to-face physical classroom environment. However, there are variations on familiar themes made possible by the technologies involved and new forms of behavior perhaps not typically encountered in the traditional classroom.

Same Animals, Different Spaces

There are some deviant behaviors that are essentially the same when comparing face-to-face and virtual/online environments, they simply occur in different kinds of places. These places consist of either shared physical space (which some might be comfortable thinking of as "real" space) or shared virtual space. If students are able to attend class unprepared with respect to the traditional classroom, the same can certainly hold true for times in which they enter a component of the virtual classroom. Of course, we must acknowledge the very real possibility that this behavior may be considered quite normal by the students and engaged in so frequently as to constitute statistically normative behavior for the classroom in question. However, it is still possible to argue that the behavior is deviant from the point of view of action potentially detrimental to the learning environment. An instructor who holds to this point of view would then have the same basic behavioral management problem irrespective of whether the behavior manifests itself in the traditional classroom or in the virtual classroom.

The following list highlights a few of the more common potentially deviant behaviors that could be construed under the same heading:

- Lack of overt involvement or active participation in the class (referred to in one form as "lurking" in on-line environments)
- Off-topic or irrelevant discussion (referred to as "babble" in on-line environments)
- Use of inappropriate or offensive language
- Personal attacks of a verbal nature (referred to as "flames" in on-line environments)
- Dominating discussion (referred to in certain contexts of on-line environments as "scrolling" or "double posting")
- Initiating discussion, making comments, or asking questions with the intent of disrupting class and creating unnecessary conflict (referred to in on-line environments as "trolling")

The behaviors listed above are probably not unfamiliar to most teachers and the likelihood that teachers have developed strategies for dealing constructively and proactively with such actions is high. It would be a mistake, however, to assume that such behaviors will routinely take place on the same scale in the virtual classroom as they might in the traditional classroom. The very nature of on-line interaction tends to alter the likelihood that individuals will engage in certain types of behavior for a variety of reasons. Many of these reasons involve the relative lack of social filters that are present in face-to-face interactions and the social distance made possible in virtual environments. Given these interactive parameters, the potential for behaviors such as personal attacks of a verbal nature can be higher in on-line environments.

In general, on-line environments tend to facilitate less inhibited and often more intense communication that can have both positive and negative outcomes for the learning environment. It is likely that some students will share their thoughts, feelings and opinions more openly and more frequently when given access to virtual means of interaction. On the other hand, that same openness can lead some students to be more expressive in ways that could be construed as deviant. The instructor who is aware of these patterns can be more proactive and intentional with strategies to maximize the former and mitigate the latter.

Unreal Animals, Real Consequences

Some behaviors translate across traditional classrooms and virtual classrooms as variants on basic behavioral themes. Since the virtual environment does not provide actors with some of the tools present in the "real" face-to-face classroom, they must utilize the tools available to them on-line to replicate the same functions albeit in different forms. A good example of this would be the translation of actual physical, embodied behaviors into virtual, text-based representations of physical and embodied behaviors. As a student in the traditional classroom, one can throw a wadded-up piece of paper at a classmate or flash an obscene gesture at the instructor. Access denied in the virtual classroom, right? On the contrary, participants in virtual environments can and will attempt to simulate such behaviors by simply creating communicative techniques that indicate action on the part of the sender and/or others. The use of emoticons or smileys (☺, ☹, :-p) serves as a very common and simplistic illustration of communicative adaptation to the lack of physical, embodied presence on the part of on-line community participants. Users develop other shared techniques to represent actions such as bracketing words with asterisks. The following excerpt (sans identifying information) from an on-line forum demonstrates this common technique:

@@@@@ 16:32 from @@@@@
dons black plate armor
picks up a big black mace
smashes an effigy of a stupid coward

Clearly, these types of symbolic representations are not "real" in the same sense that actions transpiring in the physical spaces that we share are real. However, that does not mean that virtual actions are without real consequence for members of virtual communities. Displaying words on a screen that symbolize action directed at others or implicating others has a pronounced potential to impact others who share the dialogue constructed in a computer-mediated space. Users of the virtual classroom, be it exclusively virtual or a component of the traditional classroom, would be well advised to consider the possibilities that virtual spaces offer to participants to symbolically represent (or perhaps in some respects even transcend) physical action.

Additional behaviors with deviance potential that exist as variations when translated from the traditional classroom to the virtual would include:

- Cliques or factions can exist in the traditional classroom and often manifest themselves in the ways in which students physically arrange themselves and behave as in-groups and out-groups with respect to classroom interaction. Cliques can also develop in the virtual classroom with students creating group-specific slang and usage patterns that emphasize group membership and exclusivity.
- Territoriality exists in both environments as a function of cliques or factions, but also as an individual behavior. Students, both as groups and as individuals, sometimes seek to control seating arrangements in the traditional classroom. While the virtual classroom may not provide physical chairs or seats to stake out and defend, students may treat a particular chat area or discussion forum in a territorial manner. Another variation on the same theme is the domination of a virtual space on a regular basis by an individual or group who consider the medium to be "their place" during a given time frame. In addition, students in on-line environments can also be resistant to having outsiders participating in the computer-mediated interaction.
- There are occasions where students will share personal information or opinions within the classroom that they would rather not have shared beyond the classroom. Other members of the class may not always cooperate with such wishes (or even be aware of said wishes) and unwanted disclosure may occur in contexts outside of the classroom. The same phenomenon can take place in the virtual classroom, but the available tools transform this behavior into something of a qualitatively and quantitatively distinct nature. For example, the vehicles of unwanted, non-consensual outside-of-class personal disclosures traditionally rely upon second-hand sharing of remembered and reconstructed verbalizations and attributions. This is a quantum leap removed from the ability of a student in the virtual classroom to log or cut and paste the exact written expression of another student (along with identifying information) and display it in other virtual venues for potentially vast audiences to view.

The basic admonition with respect to deviance present in the traditional classroom that might appear difficult to express in the virtual classroom is simple. If students find reasons to engage in such behaviors within the traditional classroom, they are likely to seek avenues to translate them into the virtual classroom. Anticipating this eventuality can provide users of the virtual classroom with an increased capacity to manage such behaviors both through prevention and active intervention.

Different Species, Different Planets

Finally, there are some behavioral possibilities that are essentially of a mutually exclusive nature with respect to our comparative classroom environment scenario. For example, a student who exhibits habits of maintaining personal hygiene that are offensive to others in the traditional classroom does not have the capacity to offend with this characteristic in the virtual classroom. Thus, some of the more obvious distractions possible in the traditional classroom that are based on personal appearance and bodily presence are not readily made manifest in the virtual classroom.

Conversely, some deviant behaviors that are possible in the virtual classroom appear to be non-issues in the traditional classroom. Security issues, for instance, are quite real from the standpoint of the virtual classroom. What if someone hacks or appropriates the identity of a legitimate student (or the instructor) using a virtual classroom component and then uses that identity to engage in deviant and/or illegal behaviors on-line? It is also possible for students within a class to pose as one another as they interact. In the traditional classroom, we are typically able to ascertain the accurate identity of students without much concern for breaches of security. Barring the possibility of a legitimately enrolled student with an identical twin who enters a classroom without the knowledge and consent of the enrolled twin, the occurrence of identity theft in the traditional classroom would seem negligible.

On a similar note, students are sometimes concerned about the overall security of their communications within the virtual classroom. Would it be possible for someone to compromise the security of the chat system or bulletin board and read dialogue intended only to be shared with other members of the class or with the instructor? The opportunities for students to provide (both intentionally and unintentionally) direct to access for non-class participants to internal classroom communications without detection on the part of other students or the instructor(s) are readily available through the technology of the virtual classroom. Unless we are considering a very large lecture class where unknown students may enter without notice, the traditional classroom typically operates under the assumption that all present are members unless otherwise notified. When one combines the tendency for on-line communication to be often more uninhibited than traditional face-to-face classroom communication, the stakes are raised with respect to these types of informational breaches.

Contexts for Strategies

It is essential that the instructor considering the use of virtual classroom technologies be aware of the context(s) in which the management of deviant behavior might arise. What follows is a brief, comparative summary of the behavioral implications for instructors in traditional classrooms and virtual classrooms as they relate to the management of deviance. Hopefully, this summary will help to provide a framework for gauging the appropriateness and adaptability of various strategies that can be considered.

Traditional Classroom Environment	Virtual Environment
Instructor almost always present during class interaction providing opportunities for behavioral observation and influence.	Instructor not always present during class interaction presenting challenges to behavioral observation and influence.
Instructor and students have access to a full range of communicative and interpretive tools.	Instructors and students have access to a limited range of communicative and interpretive tools.
Interactions occur in a context where conformity to desired norms is influenced by factors made possible through the physical presence of others.	Interactions occur in a context where face-to-face social dynamics normally available are absent, weakened, or altered.
Opportunities for immediate positive and negative sanctioning of behavior are continuously available.	Sanctioning opportunities often occur well after the behaviors in question have occurred.
The identity of a person engaging in deviant behaviors is typically discernable and verifiable.	Identity is not always readily apparent and can be more easily contested.
Deviant behaviors, especially verbalized deviance, cannot typically be removed or altered in form once they have occurred.	Deviant behaviors can be deleted or altered within virtual space, sometimes even before they are accessible to the class as a whole.
Short of physical removal from the classroom, class members cannot selectively choose which classmates can communicate and which ones cannot.	Some virtual environments offer members the option to filter out or block information originating from specified others.
Alerting the instructor to the deviant activities of others as they are occurring poses challenges involving social pressure, fear of reprisal, etc.	Students may be able to alert the instructor to the deviant actions of others in some environments without drawing attention to self.
Behaviors are difficult to document.	Behaviors produce authentic artifacts that are easily documented.

Important Questions

Instructors using virtual, on-line environments should minimally address several key issues when approaching the issue of deviant behavior. I have attempted to frame these issues as questions, the answers to which can only be approached from the perspective of the individual instructor and her or his students.

1. *Who will be responsible for establishing and articulating desirable and undesirable behaviors and associated sanctions as they relate to student conduct in your learning environment?* The spectrum of possibilities here range from viewing this process as the sole province of the instructor on one extreme to viewing it as the basic responsibility of the students on the other extreme with the instructor perhaps acting only minimally in the role of a process facilitator. Instructors must realize that how they choose to answer this question will frame the larger context in which deviant behavior will be experienced and interpreted by members of the class as the virtual environment evolves.

2. *Who will be responsible for monitoring on-line behavior and administering sanctions?* Once again, there are options ranging from total administrative responsibility resting with the

instructor to various levels of student-based administrative responsibility. Individual students might be given access to administrative tools that would enable them to function as forum monitors on a bulletin board system or chat room wherein they could judge the merits of individual behaviors that are called into question and subsequently determine and/or apply appropriate sanctions. Another variation on this theme would be to supply student access to system features that would allow them to identify and track problematic behavior for reporting purposes. Other system features could allow students to block communications originating from persons they consider to be problematic.

3. *How open should the community be to the evolution of new standards and norms?* Once established, the normative structure intentionally created for a virtual community of learners will be subject to the social evolution of new and often competing standards as users interact with one another over time. The answers arrived at for the two preceding questions will no doubt have already set the stage for reactions to this eventuality. My experiences with a wide variety virtual communities have led me to conclude that even the most well thought out and comprehensive efforts to provide social norms and standards for conduct cannot prevent the emergence of new folkways and mores once a stable user base has been established. The question for the instructor (and the community as a whole) then becomes one of whether new customs are to be perceived as threats to the social order or as opportunities to reinforce community. Certainly, it is also an option to simply ignore evolving behavioral standards as a benign presence in the overall scheme of things that are not worthy of undue attention lest they begin to show signs of significant impact on the life of the community.

4. *What forms of behavior exhibit the potential for enhancing the virtual learning environment and what forms of behavior are likely to diminish it? What forms of sanctions can be utilized to reinforce the former and prevent and/or minimize the latter?* These questions are germane to the conduct of any classroom, but the unique variations, possibilities and challenges posed by the virtual classroom call for at least a reconsideration of "tried and true" strategies derived from the traditional classroom. Consider the following scenario as an illustration. An instructor implements an e-mail discussion list for use in a class and discovers that there is a particular student who invariably sends high quality, thought provoking messages to the list despite being very shy and withdrawn in the classroom proper. Unfortunately from the perspective of some members of the class, these wonderful messages also contain a noticeably large and extensive automated signature file, replete even with extensive ASCII artwork. The signature file in question is often larger than the attached messages. (Remember that student utterances in the traditional classroom are complete artifacts and are not typically followed by a list of identifying personal and professional information, interesting quotes or artwork.) Is such a behavior a threat to the learning environment or is it an example of self-expression worth preserving even in the face of possible conflict and "waste of bandwidth?" Of course, each instructor and class would need to work toward a resolution that suits their respective goals and objectives in such a situation. One learning I glean from the scenario is that the needs of the community could have been far better served had there been an awareness of this behavioral possibility proactively factored into the creation and implementation of the e-mail discussion list.

Another crucial issue here is the degree to which the content and flow of information will be monitored and controlled. Administrative decisions must be made concerning under what circumstances (if any) information can be deleted, moved, filtered or altered and by whom. These are decisions that will fundamentally impact the nature of interaction within your virtual community and should be thought through carefully.

5. *How will identity be managed in your community?* Anonymity is a very common and highly cherished feature of many virtual communities, yet it also exhibits a number of potential drawbacks. Instructors might be quick to dismiss the possibility of offering a communicative medium that allows for unfettered anonymity on the grounds that it would decrease personal accountability and increase undesirable, deviant behavior. Briefly stated, the more your community moves in the direction of anonymity, the more likely it is that behavioral extremes (both positive and negative in nature) will emerge. There are many communities of users that are capable of flourishing under conditions of anonymity while others do not appear able or willing to cope with the inherent possibilities *and* responsibilities that interacting with filtered identities carry. If your learning plan includes the desire for creative, open dialogue and intensive exchanges of personal thoughts, feelings, and opinions, then anonymity is a feature worth considering. Given that objective, you must then also consider if you have planned for the potential behavioral and administrative implications that may arise. Finally, and perhaps most importantly, you must assess the degree to which your students exhibit the potential to effectively use and not abuse the privilege of anonymity.

6. *How much time will you be able and willing to devote to the life of a virtual learning community?* I raise this question to highlight one of the more commonly unanticipated consequences of implementing an on-line learning environment from an instructor's point of view. The implications that the management of deviant behavior presents are just one part of the time investment mix. For example, there will typically be a need for time on the front-end of implementation to train and acclimate students to your virtual component. Training may also be necessary for the instructor. Whether it is training related to the mechanics of how to properly utilize the technology or for necessary social and communication skills, the training will take time if it is to be useful. There will also be time required for a variety of forms of maintenance for your virtual community, especially if your users are active and make extensive use of the technology. Maintenance issues are likely to include, but are not limited to:

- modifications of code/programmatic features
- tracking usage patterns
- monitoring user behavior
- fielding user suggestions/complaints/questions
- helping to resolve user conflicts and administering sanctions when necessary
- disseminating information to the user base
- collecting/evaluating/returning electronically submitted work
- working with information/computing services staff if hardware or network problems arise
- working with software developers if software problems arise
- working with students who have administrative privileges
- working with campus officials responsible for student conduct code violations if students use your system to harass others or engage in other prohibited activities

- BEING PRESENT IN THE VIRTUAL SPACE

Finally, there can also be time associated with assessment. You may wish to create some means of assessing the learning outcomes associated with your venture in order to make informed decisions about whether or not to continue it and, if so, how you might be able to improve it. How can we know if its working if we don't take the time to assess what we've accomplished?

Final Thoughts

Instructors who have already integrated elements of virtual learning environments into their classrooms have no doubt already begun the process of discovering the breadth of possibilities offered by these technologies as well as some of the unanticipated and unintended consequences touched on in this paper. This brief treatment of the issue of managing deviant behavior in the virtual classroom hopefully provides a potential window of insight into the larger issue of the relationship between information technology and teaching & learning. The need to deal constructively and proactively with deviant behavior in the classroom is **nothing new** to the culture of education across all levels. It is precisely this common sense truth that calls us to proceed with heightened awareness as we continue to introduce new and rapidly evolving forms of technology into meaningful activities that we have grown so familiar with over time. The essential questions relate to purpose. Will the available technologies ultimately drive the way(s) we teach or will we use the way(s) we want to teach drive the kinds of technologies we create and the ways in which they are utilized?

Certainly, the situation is more complex than a dichotomous either/or proposition, but the issue remains valid in that the relationship between technology and teaching & learning requires thoughtful and insightful consideration. Educators share responsibility for the outcomes, intended and unintended, associated with the tools and methods chosen for use in learning environments. Whether it involves managing deviant student behavior or creating pedagogical approaches to facilitate the learning accomplished by students, our use of computer-based technologies will change the classroom as we know it. Indeed, it is already cliché by now to refer to the notion that we are moving away from the traditional model of the teacher as "sage on the stage" to the more technologically enabled model of the teacher as "guide at the side." If we represent an era of education on the cusp of this supposed transformation, let our choices to embrace emerging models inform the kinds of technologies we create and utilize to enhance our ability to function effectively within those models.

Technology as a Tool: We Can Change Preservice Teachers' View of Education

Dr. Jean Marie Grant
Bradley University

Abstract

Despite desktop technology being in the schools for twenty years, students in the field of elementary education often regard school technology as a separate part of the curriculum, a means for international penpals, skill development in word-processing, fun with games/drills, or perhaps as web site locations related to history or reading studies. Since teachers teach the way they have been taught and their attitudes influence their students, surely we must change these college students minds before they go into the schools, affecting the next generation. Therefore, it is imperative that we incorporate information technology throughout our preservice education programs. The presentation discusses ways technology has been brought into many education courses for information retrieval, problem solving, decision making, teaching strategies, and assessment tools. The audience will participate in discussion of further uses and improvements.

(Jean's paper was not available at the time the Proceedings went to press. She will supply copies of the paper at her talk or give a web address at which it can be found.)

Introducing Computer Science to non-majors

Kenneth Hoganson
Department of Mathematics and Computer Science
Augusta State University
2500 Walton Way
Augusta, Georgia 30904
(706) 737-1672
math@aug.edu

ABSTRACT

Recent directions in teaching computer science have focused on the content and pedagogy of the first course in computing for majors. These efforts have revolved around defining the core Computer Science concepts and ideas which then form the basis for future learning and development. This core knowledge then becomes the backbone of a breadth-first introductory course in Computer Science for majors, laying a foundation in some or all topics including computer architecture, operating systems, algorithm development, algorithm analysis, mathematical foundations and of course programming. This same approach has not been applied to an introductory course in Computer Science for non-majors, perhaps because it is recognized that non-majors will not build upon the foundation, and because non-majors often will not have the aptitude or mathematical preparation.

This paper presents the results of two years of experience with a broad topic survey introductory first course in Computer Science for non-majors at Augusta State University. A wide spectrum of students majoring in anything from music to biology take this course, who naturally vary widely in the level of analytical preparation and motivation. The content of the introductory course is presented. Student enrollment demographics are presented. Data accumulated over the trial period is explored for relationships between student performance and major, and level of analytical preparation.

1. INTRODUCTION

This paper presents the results of two years of experience with a broad topic survey introductory first course in Computer Science for non-majors at Augusta State University. A wide spectrum of students majoring in anything from music to biology take this course, with varied degrees of analytical preparation and motivation.

Recent directions in teaching computer science have focused on the content and pedagogy of the first course in computing for majors [1], [2], [3], [4], [5], [6], [7], [8]. Authors have focused their textbooks around set of core Computer Science concepts and ideas, which represent the foundation for future learning and development [2], [3], [4], [6]. This core knowledge then becomes the backbone of a breadth-first introductory course in Computer Science for majors, laying a foundation in some or all topics including computer architecture, operating systems, algorithm development, algorithm analysis, mathematical foundations and of course programming. This same approach has not been applied to an introductory course in Computer Science for non-majors, perhaps because it is recognized that non-majors will not build upon that foundation, and because it is thought that non-majors often will not have the aptitude or mathematical preparation. As a result, introductory courses for non-majors have a content that varies widely from micro-computer applications type courses to programming courses in BASIC, Visual Basic or some other structured language.

Prior to the course redesign presented in this paper, CSCI 2000, an introductory course in computing for non-majors at Augusta State University, was an introduction to computer programming using BASIC. It was observed that the majority of the student audience for this course is not likely to write code beyond the final exam. For the majority of the student audience, an emphasis on programming doesn't really meet their needs or expectations. This paper presents the results of a successful experimental course redesign that shifts the focus of the course from primarily programming to an introduction to the science and study of computing. Along with a breadth of other new topics, it retains a significant programming component, in order to preserve the insights and understanding of how computers perform their tasks.

1.1 Intended Audience

The course is intended for non-CS majors that includes students majoring in non-analytical subjects. For some, this will literally be their first experience with a computer, while others may have had significant prior computer use, including prior programming. The class may be required in their curriculum, or may simply be an elective. Freshmen to Post-Baccalaureate students may enroll in this class. The mathematical prerequisite is College Algebra, and students are not required to have completed a science sequence.

1.2 Concerns/questions to be addressed by the trial

The faculty identified some specific questions to be answered by our trial experiment.

- **Will a more science-like class raise the level of difficulty?** By making the class more science and theory and less hands-on programming, the character of the class changes. Some students find writing programs from scratch very challenging, while others find the science and theory to be harder. Because the audience for the course includes non-science majors with very little analytical interest or ability and minimal to zero prior computer experience, one concern is that the course would become too difficult.
- **Can time be diverted from programming to other topics while still teaching the paradigm of programming?** The understanding of programming provides insights into what a computer is, does, and can be used for. The question of whether sufficient time can still be allocated to programming.
- **Is the Visual Basic programming interface acceptable for the first programming experience?** Two methods of teaching programming were tried: 1) Visual Basic was used to introduce and write all programs. This requires that students learn the concepts of forms, objects, and properties simultaneous with learning subroutines, assignments, conversion between ASCII and numbers and flow of control. This represents a steep learning curve for someone who has never used a computer before. 2) The basics of programming (assignment, sequence, selection, iteration) were taught with QuickBasic and then students migrate to Visual Basic for most of the programming exercises. This allows a gradual introduction of complexity and shallow learning curve.
- **What concepts are possible in a broad-based survey course intended for non-analytical students?** Is it possible to teach a coherent introduction to a wide variety of topics to our

intended audience in a reasonable amount of time, while retaining the interest of the students? Topics include: transistors, gates, computer architecture, software design concepts, sorting and searching, algorithms and complexity, parallel processing, networking strategies and the internet.

2. COURSE CONTENT

The content of the course is composed of the following core concepts in Computer Science, presented in a 15-week semester meeting for two 50 minute lecture periods and one extended-length lab each week. After discussion, research into other courses and curriculum ideas, and experimentation the following core concepts have are included in CSCI 2000:

2.1 Core concepts covered in CSCI 2000

The following is a list of core concepts covered in one semester in CSCI 2000 [1], [2], [3], [5]. This is not a complete list of all topics covered, but only of those crucial or critical concepts. Required enabling knowledge like language syntax are covered and tested but not listed.

- **What is a computer**
  - transistor can perform logic and store bits
  - computer architecture
  - computer operating systems
- **How to control (program) the computer**
  - assignments, sequence, selection, iteration
  - subroutines, software design
  - human/computer interface, GUI
- **How to store, organize, and access information**
  - disk storage, relating stored information, databases
- **Algorithms**
  - searching and sorting
  - processing time and storage requirements and efficiency
- **How to communicate and share digital information**
  - basic data communications
  - computer networking
- **What is the Internet and World Wide Web**
  - the Internet, WWW, HTML
- **If time allows:**
  - Parallel computation or
  - Artificial Intelligence

About one-half of the semester is devoted to programming and software design, while all other topics are covered in the other half.

2.2 Detailed Concept Syllabus

AREA OF C.S.	KEY IDEAS	TIME and METHODS
COMPUTER ARCHITECTURE	transistors builds gates binary number system number system conversions bit operations, add, subtract, AND, OR memory storage of bits simple computer system architecture Von Neuman architecture and bottleneck cache - easing the bottleneck	*3 WEEKS* worksheets
OPERATING SYSTEMS	purpose of an operating system resource management: CPU time, disk, file user interface insulation from hardware complexity layers design to manage complexity	*1 WEEK* worksheets lab
TEST 1		**TEST 1**
ELEMENTARY PROGRAMMING	programming languages compilers and interpreters assembly language and machine code input, processing, output sequence, selection, and iteration flowcharts, pseudo-code, walk-thru structured software engineering subroutines, simple structure charts	*3 WEEKS* multiple QBASIC programming labs covering assignment, IF, FOR/NEXT, WHILE
MIDTERM		**MIDTERM**
VISUAL PROGRAMMING and SOFTWARE ENGINEERING	GUI interface frames, objects evolutionary or spiral model of software engineering and Visual Basic design process arrays, parallel arrays disk file read/write	*3 WEEKS* Visual Basic labs Multiple programs some with phases
ALGORITHMS	sorting arrays searching arrays algorithm performance	*1 WEEK* Visual Basic programming
TEST 3		**TEST 3**
DATA COMMUNICATIONS and NETWORKING	signaling: analog and digital modems Local Area Networks (LAN) network hardware/software	*1.5 WEEKS*

	ethernet, CSMA/CD token passing network layers, protocols, frames internetworking: routers, bridges and gateways the internet internet addressing	
WWW and HTML	the World Wide Web HTML programming and controlling appearance links to other sites links to email	*1.5 WEEKS* WS_FTP, notepad and HTML lab projects
optional as time allows: MULTIPROCESSING and PARALLEL PROCESSING	simple bus-based shared memory architecture architectural limitations and bottlenecks Amdahl's law caching	**FINAL EXAM**
FINAL EXAM		

3 ENROLLMENT DEMOGRAPHICS AND STATISTICAL ANALYSIS

What follows is a breakdown of the student audience into various categories (section 3.1), presentation of student performance statistics (3.2), and an examination of how well various factors correlate with student performance in section 3.3.

3.1 Student audience demographics

Table 1: Student Audience by Major

Physics, Chemistry, Computer *(Phy)*	16%
Biology, Pre-Med, Nursing *(Bio)*	34%
Sociology, Psychology, Criminology, Education, Political Science *(Soc)*	18%
English, Foreign Languages, History, Art *(Lang)*	9%
Business, Economics, Accounting, Finance, Management *(Bus)*	10%
No major declared	13%

Table 2: Student Audience by Standing	
Freshman	24%
Sophomore	30%
Junior	16%
Senior	21%
Post-baccalaureate, Other	9%

Table 3: Student Audience by Highest Math Completed	
Algebra	41%
Trigonometry	38%
Calculus	21%

Table 4: Student Audience by Science Sequence	
Biology	36%
Chemistry	30%
Physics	10%
None	24%

3.2 Statistics on student performance

The results of comparing student performance in terms of the average grade assigned (or GPA for that category) are presented in Figure 1. Student performance by Major, Highest Math, Science Sequence, and Academic Standing are presented. These statistics were gathered from six different offerings of the revised curriculum course.

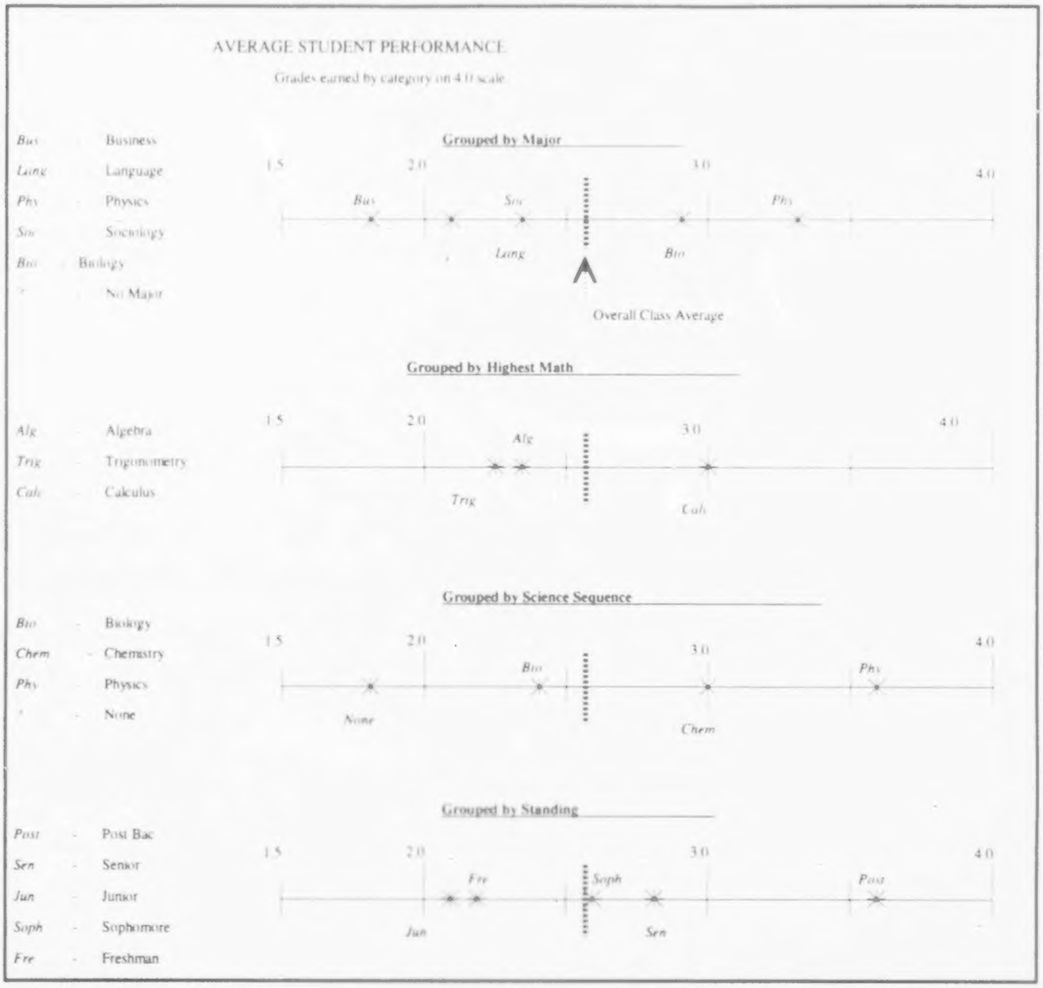

Figure 4. Student Achievement by Major, Highest Math Completed, Science Sequence Completed, and Standing based on a 4.0 scale.

A drop in the rate at which students withdraw has been observed with the new course composition. The new breadth topic curriculum has exhibited a withdrawal rate of about 8% over six course offerings, while the previous programming-only course experienced a withdrawal rate of about 17%, also over six course offerings.

3.3 Interpretation of statistics

Student performance as represented by the data in Figure 1 is examined by category for conclusions and observations about the new course curriculum. The concerns and questions of section 1.2 will be reviewed in relation to the statistics

3.3.1 Academic Performance by Major

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The average student performance for the grouping majors in the *Lang* and *Soc* categories were so close as to appear as the same point in Figure 1. The more analytical majors in the *Phy* and *Bio* groupings achieved better average scores than students majoring in less analytical subjects. This expected variance is large enough to be imply a correlation between major and success in this course.

The substantial difference between majors in the sciences and those in business confirms that the course is an analytical science course. Comparative data from the original course design is not available, so it is difficult to argue that the course has gotten more or less analytical with the revised curriculum. However, the increase in the percentage of students who complete the course from 83% to 92% indicates that even if the course has become more of a science course from its programming course origins, that change is one that is perceived positively by the students. Anecdotal evidence indicates that the increased variety of topics retains student interest and involvement, whereas students who do not expect to write programs beyond this course experience, become tired and frustrated with an entire course consisting of programming .

3.3.2 Academic performance by highest math

Figure 1 shows how student math preparation correlates with achievement in CSCI 2000. There appears to be a small correlation between upper level math courses and student performance, but perhaps not a significant one. The better performance of students who have completed calculus could be explained by the observation that students in analytical majors are required to complete calculus, and it has been shown in that analytical majors perform better. This data does allay the concern that the course will become too dependent upon mathematics in covering topics in networking and parallel processing. An overview of those topics can successfully be presented to students with no more mathematical background than algebra.

3.3.3 Academic performance by science sequence

Figure 1 shows a large variance in academic performance based on the science sequence students have completed. This agrees with the earlier finding that the revised curriculum is easier for science and engineering-oriented students, who can complete the analytical science courses in physics and chemistry.

3.3.4 Academic performance by standing

The results in Figure 1 do not show a strong conclusion correlation between the student's standing and success at the undergraduate level, indicating that the course is approachable and appropriate for students at all levels. Post-Baccalaureate and Additional-Degree students were shown to perform well.

4. COURSE DESIGN CONCERNS EXAMINED AND PEDAGOGY ISSUES

The analysis from section 3 is used to address the concerns/questions raised in section 1.2 about the effect the course redesign will have on student performance. Teaching is not a repeatable experiment where only one factor is allowed to vary (i.e., it is not possible to re-teach the same students the same subject with alternative methods) making some conclusions somewhat tentative.

Will a more science-like class raise the level of difficulty?

The results from section 3 show that the course is reasonable for students with a wide range of math backgrounds, who vary in their major and year of progress toward their degree. The course level of difficulty is not beyond the grasp of its intended audience, though some students will tend to do better based on their aptitudes and preparation. The lower withdrawal rate may indicate that the course has actually gotten easier rather than harder. Alternatively, it may indicate that the course is closer to what students are used to in other classes, or that the course is simply more interesting .

Can time be diverted from programming to other topics while still teaching the paradigm of programming?

The course was able to move students to a competent level of understanding of programming concepts up to and including reading and writing data files, sorting and searching parallel arrays, and visual interface programming and design. These objectives were accomplished in about one-half of a semester, allowing time to be directed toward the other course objectives.

Is the Visual Basic programming interface acceptable for the first programming experience?

Two methods were attempted in teaching programming: 1) introduce programming with Visual Basic and carry-out all programming assignments with Visual Basic and 2) introduce programming concepts with Quick Basic, then move to Visual Basic for more sophisticated concepts and programs. A definitive advantage to either of the two methods was not discerned, because it seems that both methods can be made to work. It may be possible to cover more material with the second method because students seem to get up-to-speed faster with the shallower initial learning curve.

What concepts are possible in a broad-based survey course intended for non-analytical students?

The experiment was successful in teaching a broad-sweep of topics and concepts in Computer Science to non-majors. Topics ranging from transistors to parallel programming and Amdahl's Law through programming to networking, the internet and the World Wide Web were all successfully taught. There did not seem to be a topic or section that was especially challenging for students. Some preferred the non-programming science topics, while others preferred the hands-on programming portion.

Use of HTML web-based course materials:

The initial investment in time to create and post course materials on the web was significant, but paid for itself in time savings in successive classes. The use of HTML-based course materials seemed to be especially helpful in the following four areas:

1) Presentation of topics not included in the textbook. The wide range of topics covered precludes adequate coverage of all topics with one single textbook, requiring additional instructor prepared materials. Topics such as using transistors to build logic gates and constraints on parallel processing performance were supplemented by materials developed by the instructor and placed on web pages

for access by students.

2) The posting of examples on the web facilitated student mastery of concepts. Lectures were supplemented with a computer/projector that can display web pages. Students spent less time taking notes and drawing diagrams, and more time trying to follow the lecture, which was especially helpful for complex topics. The use of web-based instructional materials seems to allow more material to be covered over the term.

3) Resources including copier expenses, instructor handout distribution, management and upkeep time were reduced and simplified with handouts and resources on web pages. Some students read handouts in electronic form without a hard-copy, which allowed students to keep up with their handouts and lab project better. The materials are always available on the web page, accessible from campus and from home.

4) Posting the lab projects in advance on the web encouraged students to read over and think about upcoming assignment before coming to class, which many found to be especially helpful.

5 CONCLUSIONS

The course redesign concept proved successful in just the first few offerings, and quickly moved beyond the experimental stage after the first year. It is now our standard syllabus for the class though individual instructors vary the content within the overall framework. The consensus is that students are successfully learning more material with a greater interest and increasing success. The course has been well-received by students and faculty in other departments.

The first required course in the computer science sequence at Augusta State University is an intensive and fast-paced C++ programming course, with a high student failure rate, and minimal coverage of non-programming topics. Anecdotal evidence indicates that the redesigned introductory course serves as a broad-based foundations course for tentative computer science majors, that increases their subsequent chance of success in the required major courses. Students who are interested in majoring in computer science are being encouraging students to try this course first, especially if they have no prior programming experience.

The redesigned CSCI 2000 has also served to funnel a few students into computer science from other majors, who had no previous interest in studying CS until this course. Those students are working their way through our curriculum, though there has not been sufficient time to determine whether those students will ultimately complete the degree.

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Evolutionary Development of an Institution-wide Technology/Curricular Planning Process

Thomas W. Horn, Director of Information Technology
Matthew Hollern, Associate Professor and Chair of Crafts Disciplines
Cleveland Institute of Art
Cleveland, OH

Abstract

This presentation will provide insight into the process followed by a small art college in the evolutionary development of an ongoing mechanism for effectively dealing with the ever changing technology and related curriculum. This will include an overview of the event which triggered the process over four years ago, the establishment of a cooperative, ongoing joint faculty/administrative computer committee and the changes which have been made in the committee's initial mandate as a part of what has proven to be a naturally occurring evolutionary and maturational process.

I. Rationale for the paper

- A. ASCUE Experience
- B. The value of the shared history
- C. Self study: reflections and projections
- D. Commitment to: process, change, improvement

II. Institutional History and Profile: Unique versus Parallel

- A. Students and Faculty and Staff
- B. Facilities and Resources
- C. Administrative structures and roles
- D. Faculty structures and roles

III. Technology and Curricular Planning

- A. Process and Project Histories
  - 1. Initiative and Participants
  - 2. Structures: Administrative and faculty
    - a. Committee versus Task Force
  - 3. Factors and Influences
    - a. Grants and Gift
    - b. Curriculum and Forward Planning

IV. Elements of Evolutionary Change

A. Charge / Mandate / Support
B. Representation: Membership and Leadership
C. Process Development and Outline
D. Agendas: Personal and Institutional
E. Partnerships
    1. Projects and Participation
F. Funding
G. Implementation
    1. Planning
    2. Prioritizing
    3. Phasing
H. Forward Planning
    1. Steering Committee: Teaching / Learning / Technology
    2. Departmental Vision and Curricular Planning
    3. New Technology: Subject / Context / Delivery
    4. Training / Support / Advancement

MATTHEW HOLLERN
Cleveland Institute of Art

Biography

Matthew Hollern was born in Madison, Wisconsin in 1964. He began work in jewelry in his junior year in High School, and made metalwork the emphasis of his education at the University of Wisconsin-Madison where he earned a Bachelor of Science degree, majoring in Art and French. In his junior year he studied at the University of Aix-en-Provence, France where he also worked with a blacksmith at the Ecole Des Beaux-Arts. He received his Master of Fine Arts degree in 1989 from Tyler School of Art, Temple University. He was awarded a grant funded by the NEA from the Society of North American Goldsmiths for his graduate research project, "Welding Aluminum for Successful Anodizing" and presented his paper at the 1989 conference in San Antonio, Texas. Matthew Hollern is an Associate Professor of Art, Chair of the Crafts Disciplines, and Associate for Faculty Affairs at the Cleveland Institute of Art where he has taught Jewelry and Metals since 1989.

Instructional Technology at Pikeville College
Past, Present and Future

Dr. Debby Keen and Dr. John Nelson
Pikeville College
Science/Math Division, Education Division
214 Sycamore Street
Pikeville, KY 41501
606-432-9365
dkeen@pc.edu, jnelson@pc.edu

Introduction

Pikeville College is a small (800 students) private liberal arts institution located in Pikeville, Kentucky. Pikeville is the hub of Eastern Kentucky with a population of about 5600, in the middle of the Appalachians.

This presentation, presented jointly by Debby Keen, Ph.D. and John Nelson, Ed.D., will focus on the introduction of instructional technology to Pikeville College. The presenters will examine the history of informational technology on the Pikeville College campus: where we were, where we are and our plans and hopes for the future.

Dr. Keen, a computer science professor, will examine the history of our current services. She will elaborate on our past: how computers were introduced to the campus, the uses for faculty as well as student use.

Dr. Nelson, an education professor, will examine the present uses of IT on campus. He will also examine the history of IT as it directly relates to the Education Division. The state of Kentucky has radically changed its programs for teacher certification in the past 5 years; the process continues to change even now. One major aspect of KERA (Kentucky Education Reform Act) is instructional technology, especially in isolated rural areas such as Eastern Kentucky.

The two presenters will describe the history of informational technology at Pikeville College over the past 20 years. In addition, they will show Pikeville College's commitment to IT and a continued pattern of growth into the next millennium.

Our Past - 1979-1994

Pikeville College's history of instructional technology is probably typical of most small private colleges, maybe a bit slower to incorporate new materials than the average college. The isolation of the area made it difficult to purchase computers and to get maintenance on machines when they needed work. As well, it was difficult to find qualified instructors who were willing to come to the area.

Hardware

Before 1979, the only computer-related courses at the college were one COBOL programming course, actually done on a local bank's computer, and a course on using programmable calculators. The college started using instructional technology in 1979, with a donated machine, an IBM 5110. The machine was a precursor of the IBM PC, with 8-inch floppy drives, 32 Kbytes of memory and a 5-inch monochrome monitor.

A chemistry instructor taught a class or two in BASIC on it, and some coal-related research was done on it for a few years. By 1982 we had 6 microcomputers, TRS-80's, each having 32 Kbytes of RAM and 2 floppy drives. In 1986 we got our first IBM compatible machines, Tandy 1000's (8088 processors, 2 floppy drives, 640 Kbytes of memory). During the mid and late 80's we acquired a few other PC-compatibles, including IBM PC Model 30's (80286 processors) and IBM PC Model 25's (machines suitable for a student's dorm room, not a computer lab). Swan, Packard Bell, and others too numerous to mention appeared in ones and twos in the labs. This caused some obvious maintenance problems.

As well, we received donations at various times; most were not very useful, but one, a small Unix computer (AT&T 3B2) and some terminals, proved instrumental in getting our first Internet connection (see below).

The Computer Science and Data Processing Majors

The Computer Science major and a Bachelor of Business Administration with a Data Processing emphasis were officially approved as majors in 1983. We had been offering courses in computer science for two years previously. We offered courses usually offered in a computer science major: Pascal, other languages, data structures, numerical methods, compiler design, machine organization, database design. We had three instructors - myself with a Master's degree in CS, Teresa Rice with a Master's in math and Dr. J.P. Lee with a doctorate in math and 18 hours in CS. Teresa Rice left the college in 1984, Dr. Lee in 1986. Most of the faculty who have taught computer science courses since have stayed at the college for only a year or two. The faculty at present seems to be fairly stable at 4 individuals, 1 full-time and 3 part-time Computer Science.

Our first student with a CS major graduated in 1984; he went on to finish a Master's degree in Computer Science at the University of Kentucky The most students with CS majors graduated in any one year up to this point is 5, with a total number of CS and BBA's graduated to date of 45. We have had three students altogether continue on to graduate school and earn Master's degrees in Computer Science.

The Physical Environment

The first room we had for a computer lab was one small room in the basement of the Administration building, with very little in the way of climate control (one air conditioner in the window), computers in a circle facing the walls. There were two printers shared by A/B switches, since we had no network.

We moved into a former chemistry lab (3rd floor) in the Science Building that still had the chemistry hoods installed, in Fall 1983. It had much more room and somewhat better environment control. We still had no networking; printers were shared by A/B switches. The room was not too good for lecturing, because of poor acoustics.

In 1986, we expanded into another lab in the basement. These two labs had 15-18 machines apiece in the Science building. Usually the basement was where classes took place; the other was normally open for all users. This occurred when the CS 101 Introduction to Computers course (or some higher CS course) became mandatory for all students.

Our most recent move has been to the Administration building again (1997), into a newly remodeled area. The two rooms are more conducive to lecturing, but the acoustics are still poor. Wiring is substandard; climate control is usually not effective. We do have a network with a nice laser printer, and an Internet connection.

Computer Lab Supervision and Support

It was the view of the administration that a full-time faculty member would have time to supervise the labs, repair the machines, order the supplies, supervise the work/study students, and sweep the floor, while teaching 15-18 credit hours a semester. One faculty member did this from 1983 to 1990, with no additional compensation. When she left in 1990 to pursue doctoral work, a series of part-time or nine-month people were hired, followed by another full-time faculty member who did the work for 2 years and left.

To have support for the machines and the teaching labs, we have always depended heavily on the Work/Study program. This usually provides a sufficient quantity of students to supervise the labs and provide some assistance to students, although the process does not guarantee anything about quality. We have done some training in the past, without much success. Most of the work/study students knew very little about computers from little prior experience, and did not want to learn any more. We have been lucky in finding extraordinary individuals from time to time, students who were interested and willing to learn, with a sense of responsibility. It does seem that we are getting work/study students with a bit more computer experience in recent years.

One work/study student became "Lab Manager" when he graduated (1995);he was hired to supervise the labs. He was only hired part-time, and was then expected to install and support all microcomputers on campus. By this time, there were several in administrative offices; still very few faculty had any kind of machine on their desks.

Maintenance of the machines was usually done by outside contractors, either the vendors such as Radio Shack, or local computer companies, of which there were two within a 100-mile radius of the college. Some of the more skillful work/study students attempted some repairs with moderate success. Sometimes machines did not get repaired for a while because of budgetary constraints.

Administrative support was minimal. Part of it was an attitude of "let them use slide rules". Part of it was a lack of funds. We did what we could with what we had. A useful attitude that we learned : "If equipment is limited, these students will be able to make do with less than a student who has everything handed to him. Getting around those limitations will make them more creative and better problem-solvers".

Connecting to the Internet

This was only a dream for many years, due both to a lack of funding and a lack of local support. There were no Internet Service Providers in Pikeville until 1996. An attempt to connect to the Net was made around 1990, funded by the Appalachian College Program, based then at the University of Kentucky. Using the donated Unix machine, we were able to manage a "store and forward" kind of email. A mail server at UK was called once a day, usually in the middle of the night for the lowest rates, and mail packets were exchanged. During the time the link was active, a few faculty and students were assigned accounts. For most of them, it was their first experience with email. This process was maintained by part-time lab managers for about two years, at which time the funding ran out and interest lapsed.

The Library

Computers were first added in the college library in the mid 1980's, for doing literature searches on CD ROMs. Most of this was funded by the Morehead Graduate Consortium for use mainly by their graduate students who were taking courses at Pikeville.

Other Courses using Computer Resources

Other instructors began to take advantage of the computers, as the number of machines grew large enough to support the demand. Business and Mathematics instructors were most interested in expanding their courses, through the use of spreadsheets particularly (we had a version of VisiCalc for the TRS-80). Some science classes started using the PC compatibles for lab reports, and for analyzing their experimental results.

When the Introduction to Computers class became mandatory for all students, the student body gained new skills in word processing, spreadsheets, and database management. This encouraged instructors who required written work to ask students to use a word processor. This feedback has increased the amount of usage of computers on campus in general.

The Effect on the Community

Graduating more students with computer skills has spread these skills through the community. Students in this region of the country tend to desire to stay in the area. This increases the general computer literacy of the community. There are now at least three medium sized computer stores in Pikeville as well as several smaller ones.
Especially important is the fact that we have produced a large number of the educators in the public schools in the area; their computer literacy hopefully will be passed on to their students.

We have offered Community Service classes for many years. These classes carry no college credit and only meet for a few weeks at a minimal tuition. The ones dealing with computers have always been popular, with students from age 10 to 50+. Some faculty have done some consulting for businesses in the region, as well as some of the local government offices.

Where do our majors go when they graduate? The early ones had either the choice of leaving the area (our first graduate did) or taking a job that did not make much use of their degree. This situation has improved and deteriorated over the years. At one time most of the banks in town had some of our graduates in their data processing departments. When the banks outsourced their computer work to out-of-town firms, it had a negative effect on job prospects. Lately the trend has been in the other direction; banks are starting to once again do their own data processing. Other employers were and are the local hospital, several of the largest coal mining companies, local contracting companies, local insurance companies. Now that ISPs are located in or near Pikeville, they hire several students for part-time work and some graduates for full-time.

And of course many of our graduates do leave the area. We have graduates living from Chicago to Florida. Two are working for NASA at the Space Center, one is working for Motorola (getting his own patents), and at least one is working for IBM.

The Present: An Educational Perspective (Gee...Are We Really Here?)

The present status of IT at Pikeville College is a great improvement from the past. Currently the College is on a T-1 frame relay system. From our Administration Building, fiber optic cable is used to connect the Armington Science/Medical building as well as the Derriana dorm, and Allara Library. The rest of the campus accesses the network by dial-up modem. Faculty, staff and graduate students are allowed to access from home by modem.

The hardware is being drastically improved...daily it seems. The campus does not currently provide Internet accessible machines to each and every faculty/staff member, but the problem is being worked on. Five years ago this would have been a pipe dream but not so today.

The Medical School

One of the biggest curriculum changes on the Pikeville College campus came with the addition of a School of Osteopathic Medicine (PCSOM). This one addition to the College family has vastly improved IT on our campus. The medical school is only the third school of medicine in our state (University of Kentucky and University of Louisville are the others) and the only one associated with a four-year liberal arts institution.

Our location in an isolated region of our state presents many unique problems that only tele-medicine can solve. Over the past 8 months our campus has watched a mini-revolution in IT. The College's Telecommunications Center and medical library is being built with low-band micro-wave connections to the Big Sandy Telecommunications Center. The two separate entities will work together in a joint venture in order to ensure this area has state of the art tele-medicine, compressed video, Internet services for not only our campus but for the entire region.

IT and The Kentucky State Department of Education

As it is with many small four-year liberal arts institutions in our nation, our education major has driven our undergraduate curriculum. Most of our majors have been in some way education related.

The relationship between instructional technology and teacher preparation is both integrated and complex. In 1989, the Supreme Court in Kentucky outlawed the educational system and demanded instant reform. The result, a collaboration between the state legislation and department of education was/is KERA (Kentucky Education Reform Act). The landmark Act (House Bill 940) was conceived and enacted by the courts, state legislator and educators. It was approved by the General Assembly in 1990. The results are still being assessed and fine-tuning occurs daily. Yet, the state of Kentucky went from a national ranking in education of 49th among states to a current 16th as evaluated by *U.S. News and World Report.*

Technology is an integral part of KERA. Currently, the system is structured by eight New/Experienced Teacher Standards. A new ninth Teacher Standard is being added: technology. Both the understanding and application of IT will be required in order to be certified as a teacher. Therefore, new courses have and will appear in our undergraduate curriculum that address technology.

TEACHER STANDARD IX
DEMONSTRATES IMPLEMENTATION OF TECHNOLOGY

Standard Statement IX: The teacher uses technology to support instruction; access and manipulate data; enhance professional growth and productivity; communicate and collaborate with colleagues, parents, and the community; and conduct research/solve problems.

PERFORMANCE CRITERIA: The extent to which the teacher:

1. Operates a multimedia computer and peripherals to install and use a variety of software.
2. Uses terminology related to computers and technology appropriately in written and verbal communication.
3. Demonstrates knowledge of the use of technology in business, industry, and society.
4. Demonstrates basic knowledge of computer/peripheral parts and attends to simple connections and installations.
5. Creates multimedia presentations using scanners, digital cameras, and video cameras.
6. Uses the computer to do word processing, create databases and spreadsheets, access electronic mail and the Internet, make presentations, and use other emerging technologies to enhance professional productivity and support instruction.
7. Uses computers and other technologies such as interactive instruction, audio/video conferencing, and other distance learning applications to enhance professional productivity and support instruction.
8. Requests and uses appropriate assistive and adaptive devices for students with special needs.
9. Designs lessons that include technology and human issúes to address diverse students needs and different learning styles.
10. Practices equitable, and legal use of computers and technology in both professional and personal activities.

11. Facilitates the lifelong learning of self and others through the use of technology.

12. Explores, uses, and evaluates technology resources: software, applications, and related documentation.

13. Applies research-based instructional practices that use computers and other technology.

14. Designs lessons that integrate computers and other technology to create effective groupings to meet the needs of diverse learners.

15. Uses technology to support multiple assessments of student learning.

16. Designs lessons that ask students to practice the equitable, ethical, and legal use of technology.

Campus Wide Use of IT

Faculty and staff are beginning to embrace the idea of developing their own web pages. Currently some faculty are offering courses that are entirely web based and other use the web for supplements. The faculty do this, in most cases, without hardware provided by the College.

Currently we have three labs with approximately 45 machines acquired a year ago; these are Pentuim II's, with 4 gigabyte hard drives. The students can and do use the services provided. The campus is networked allowing many services to be performed unheard of a year ago. Our past critics are now eagerly embracing the use of IT and fight for hardware and not old machines good for only word processing.

This academic year a series of Faculty/Staff workshops have been held on various aspects of computer technology use from email to Microsoft Office to networking. The attendance has been encouraging so far.

Connection to the Internet

In 1996 the College, with the aid of an National Science Foundation grant, made the first full-time direct Internet connection. This was an educational experience for the IT staff of one. This connection is slowly being integrated into many classes and into campus daily life. General announcements are being made by email; lists of classes closed during advance registration were circulated by email. A new course on HTML is being offered this semester (Spring 1999). HTML has also been added as a new component for some Business classes.

Our Future 2000-?

Hardware

With some luck, all the lab computers will have a RAM upgrade before very long. As far as replacing them when they begin to fail, it is hard to predict what will be done. There are plans for a new modem pool so that all students as well as faculty and staff will be able to dial in from home.

Will all faculty be able to expect a computer on their desks? Stay tuned and see! We are hopeful.

In the near future (in the next six months), we hope to have all publicly accessible computers converted to the Windows NT operating system. This will make our labs Y2K compliant just in time. Funding for this may come from the Kentucky Colonels association.

The Computer Science and Data Processing Majors

Both majors still exist, although the BBA with emphasis in Data Processing has become a BBA with emphasis in Computer Science. With the addition of the Computer Science endorsement for Education majors, it is hoped the majors will be viable for a long time to come.

Physical Environment

By next year, the college will have an Educational Resource Center. It is one room in the Administration Building that will house materials for the Education majors to use to supplement their courses. It will include 6 PCs for learning to use educational software and for research on the Internet. Hopefully, the climate control for the existing labs will be improved by the end of the summer.

One student dormitory is in the process of being renovated, and a computer lab is planned for one room in its basement. The rooms will also be wired so the students can plug in their computers in the dorm rooms and be on the college network.

Another building that is next on the list for renovation is a combination of faculty offices and dormitory rooms. This building is one of the older ones on campus and it will be a major project to get it rewired up to code standards. Eventually it too will be on the campus network.

Getting one other building, which contains offices and classrooms, wired for the network is a long-term goal. It contains the Nursing faculty and classrooms as well as many of the studios for dance and art. Each of these buildings would have connections for faculty and students to connect to the campus network and the Internet.

Funding sources are not revealed but it would seem that it is easier to get funds for "bricks and mortar".

Computer Lab Supervision and Support

The situation has improved greatly from the past. Most importantly, the administration attitude towards IT has changed and is much more technology friendly. Hopefully this trend will continue.

The increase of the size of the Instructional Technology staff to four is a great step, but a group of four people to support over 360 computers and a campus-wide network is still not sufficient. That number includes PCSOM students, PCSOM staff and faculty, administrative computing, machines available to the undergraduate students, undergraduate staff and faculty. The teaching labs do not have full time supervision and suffer from the lack. It is hoped another person or two can be added to the IT staff.

Connecting to the Internet

This connection will probably be maintained and expanded. The administrative staff is starting to rely on email for normal communications; faculty members are relying more heavily on access to the Internet and email access to their students. Bandwidth demand will only increase as is the usual trend with networks.

The Library

We anticipate that the automation project for the library will be completed this summer. As described under "The Community", the library will be gaining some room in the Pikeville Telecommunications Center when it is finished. They are also looking to acquire a data projector, and to network their older computers together.

Curriculum

"Writing Across the Curriculum" is a trend that is growing at Pikeville College. This usually entails the addition of technology in the form of computers in writing labs, new word processing software to accommodate the writing demands of various courses.
Some funding for this comes through the Appalachian College Association.

The Faculty/Staff workshops will continue, with the goal of improving faculty and staff utilization of the technology available.

The Community

The city of Pikeville is building a new Telecommunications Center, which will include the County Library. One floor is supposed to hold a part of the Library for the PCSOM. It will also hold the Big Sandy Telecommuting business offices. There will be facilities for video conferencing and distance learning which will be available to all of Pikeville College.

Challenges for the Future

One challenge facing the school in the next year or two is a large Technical School being built in Pikeville. The state government is supporting its construction. It will certainly force us to look at what we offer students and what would improve our offerings.

There is a growing trend towards distance learning and web-based courses. More courses that have Web components or are totally Web-based will be developed at the college. It is a challenge to convince the faculty to accept this idea as a supplement to traditional instruction.

More professional development in this area is needed for faculty and staff. The subject changes so quickly no one can remain up-to-date for long. Funding for this seems to be more plentiful than in the past.

What did we learn from this process?

1. The support of administration is very important. The money seems to be found if they think it is important.
2. Accrediting agencies can be your friend. They seem to be increasing their requirements for technology for faculty and students. This can provide outside pressure if needed.
3. You can do a lot more with a lot less than you thought you could. It isn't necessary to have the latest in technology to teach; it makes some tasks easier, but it is still possible to produce well-grounded students with less than the latest.
4. Incremental changes are best. Forcing faculty and staff to accept the new technology quickly is usually counterproductive.
5. Do as much faculty development as you can, both on and off campus. The more people who feel they need technology in their classes, the more allies you have.
6. Patience and persistence are both virtues to be cultivated.

Cyberfluency in the 21st Century: Vive le Cyberspace

Thomas P. Kelliher, Jill Zimmerman
Department of Mathematics and Computer Science
Goucher College
Baltimore, MD 21204
http://phoenix.goucher.edu/~kelliher/
kelliher@goucher.edu
(410) 337-6189
http://phoenix.goucher.edu/~jillz/
jzimmerm@goucher.edu
(410) 337-6227
Sandra Webster
Department of Psychology
Westminster College
New Wilmington, PA 16172
http://www.psych.westminster.edu/skw/
websters@westminster.edu
(724) 946-7359

Introduction

Today, our students face new worlds filled with both opportunities and perils. The vehicle of these new worlds is the Internet and the new worlds themselves are the countless sites on the Internet. The Internet is capable of bringing people together in ways only previously imagined in science fiction. This fosters online communities and broad sharing of information. Individuals with a common interest no longer need to come together in physical time and space to cultivate that interest with others. One person can quickly and easily communicate with literally millions of people around the world. Indeed, we have arrived at the Global Village.

Approaching the millennium, how do we best prepare our students to handle the onslaught of online information, to communicate effectively via various electronic media, to work asynchronously in multidisciplinary groups, and to take advantage of rapidly evolving technology? Traditional computer literacy is inadequate for supplying students the tools they need to flourish in this new world, advanced by constant breakthroughs in computing and communications, and adapt to quickly evolving changes in the workplace. We have coined the term "cyberfluency" to represent the skills necessary for success in this new environment.

In this paper we paint our vision of cyberfluency, relating our experiences in designing and teaching two innovative cyberfluency courses. One is a two-class cluster course, combining Psychology and Computer Science perspectives on the Internet, taught at Westminster College. The other is a Computer Science course examining computing and its impact upon society, taught at Goucher College.

Cyberfluency

Just what is cyberfluency and how does it differ from computer literacy? Computer literacy has evolved considerably over the last two decades. Originally, its largest component was programming in a high level language such as BASIC or Pascal. During this period, end-user applications were few and far between. Shortly after the introduction of the IBM PC and the growth of personal productivity software, the emphasis changed to learning how to apply that software, obtaining an understanding of how the software interacted with the underlying operating system and hardware, and examining a few issues within the broad arena of computing. These issues included the limits of computers as seen by artificial intelligence researchers and the uses of computers within various segments of the workplace.

Currently, the focus is upon the Internet and the expanded communication capabilities it provides. To us, "cyberfluency" represents understanding how to work with computers in a networked society. This term flows from language fluency, implying that one can produce something, not merely digest what others have produced. The definition can be broken into three parts: working with computers, networks, and society.

Why bother attaining cyberfluency? Computing and networking aren't about to vanish, despite the dire predictions of Y2K naysayers. We are well past the stage of the Internet merely being a temporary novelty. Individuals and institutions have incorporated the Internet into their daily lives. It provides new capabilities. The problem solving skills inherent in cyberfluency have broad applicability to numerous areas besides computing and communications. Critical thinking skills and the ability to evaluate information become more and more important as the number of sources of information increases and the number of information filters decreases. Additionally, although computers are complex machines, we are far from being able to ignore what's "under the hood," just as in the early days of the automobile.

Often, teaching methods associated with computer literacy emphasized proper procedure: the correct way of structuring a program, the correct way of formatting a document. Methods and procedures were first studied before using the software. There are those of us who have read manuals through, cover to cover, before sitting down and using the software. Times have changed and so has the way people approach computing today. Students today learn by experimenting, trying various approaches until they find one that works for them. The notion of the "correct way of doing X" holds little or no meaning for them. As Sherry Turkle has noted, today's youth are learn computing by exploring[1]. So we've shifted from the "one right way" to finding your own way.

Each semester brings new opportunities and challenges with which to present a class. Spring 1997 there were the Heaven's Gate suicides. Spring 1999 we had Melissa, revelations regarding the MS Office GUID and Intel's unique identifier on the brand new Pentium III chip. These events underscore the relevancy of cyberfluency for students, faculty, and college administrators alike.

Working with Computers

What does "working with computers" mean today? Unfortunately, today, it often still involves getting our hands dirty. Computers (and networks) malfunction. We attempt to diagnose and correct the problems. When we encounter a problem we can't solve ourselves, we call in an expert, whether it is a friend, the local helpdesk, or a manufacturer's technical support personnel. There are other things we must do as well. Software must be installed. The hardware might need to be upgraded or replaced. We might encounter different types of computers and types of operating systems. Underlying all of this are problem understanding and solving skills, as well as communication skills.

What's the best way to develop the step-by-step methods of solving these kinds of problems or communicating them to others? How about ... writing a program? The discipline necessary for understanding a programming problem and setting down on paper the precise sequence of steps for carrying it out works extremely well for considering the problems we encounter here, whether we ultimately solve them ourselves or have others solve them for us.

Problem solving and critical thinking skills are the basic underpinnings of cyberfluency. Returning to the automobile analogy, we need to be able to fix the "car" ourselves. Our students should be able to diagnose and repair some types of hardware and software problems. They should be able to install new software and upgrade the hardware within a PC. These are very basic problem solving skills.

Networking

Critical thinking skills are especially important in a networked environment. There is so much material available on the Internet, some of it contradicting other material, some of it false, much of it fancily packaged "eye candy" that catches our attention. We must teach our students to separate fact from fiction, information from persuasion. Going beyond mere information finding, how can the Internet be used to solve problems? What problems does it create?

Today's workplace often brings together people of different backgrounds and abilities who must function together smoothly as a team. Their areas of technical expertise as well as group skills are called into play. Each team member must apply his or her area of knowledge to the problem being solved, but must also communicate effectively with other group members. Team members may be separated in time and space, using the network to bridge the distance in time and space using e-mail, shared folders, bulletin boards, collaboration tools, and other electronic tools. Thus, teams use social and electronic networks to carry out their tasks. The electronic network supports and extends the social network.

Another aspect of networking involves locating and evaluating information placed out on the network. We use various search strategies to find information. Often the amount of information that may be relevant is immense. Once we have that information, the next problem is finding that information which is important to us and then attempting to measure the amount of truth in it. Formerly, we could search for information in libraries, secure that what we found there was valid. This is no longer true with Web searches. Now, we must scrutinize Web pages carefully to determine if what we've found is factual material, opinion, propaganda, or advertising. We examine the author, the supporting institution, and the immediacy of the information. The burden on us has increased.

Yet another aspect of networking is how we ourselves communicate across the network. When we place information on the network for others, we must apply our evaluation criteria to ourselves. When using e-mail or other forms of online communication, we must bear in mind the notion that we tend to forget, due to the time and space discontinuity, that we're addressing another person on the other end of the wire and not the machine in front of us. We have to remember to search for information before asking others for it and determine the proper venues for making our queries.

Society

We all hold responsibilities to the society within which we live. On a daily basis, network technology forces us to confront questions such as: So what if this is a copyrighted image? Who's watching my "click trails?" How can I ensure that my password isn't "sniffed?" Why can't I use that image for my wallpaper, it is art? These questions and more have to be dealt with in the online world.

It's vital for us to develop a coherent set of principles for application to these new online worlds. Take copyrights as an example. It's so easy to copy an image that we don't even think about the copyright issues involved. Additionally, some of the issues are quite subtle --- is it acceptable to link to someone else's image rather than directly copy it? Considering the sort of medium that the Internet is, doesn't one implicitly give up one's rights on anything posted to the Web? When someone copies software at the office for home use or a colleague's use does he or she understand the legal ramifications of his or her actions? How do we make sense of all the different forms of software use licenses?

How does one determine which uses of a network are acceptable and which are not? Where do my rights end and another's begin? Most academic institution's acceptable use policies prohibit use of network resources for financial gain. If I'm writing a book for which I expect to receive royalties, have I violated the policy? When is a mass campus e-mail spam and when isn't it? How should individuals deal with what they consider to be spam? What do we make of groups such as Heaven's Gate? Militias with hate-filled Web sites? How do we reach out to those who fall into isolation inside the network? Indeed, is the network turning us into a nation of islands or is it bridging those islands?

An effective way of handling these questions is by bringing them up as case studies. For better or worse, finding the cases isn't difficult. One of the authors served as a College's webmaster for two years. During that period, several conflicts arose forcing consideration of the following questions: What constitutes offensiveness and who decides? Do students have a right to have Web sites? Are there limits to what they can post on their Web sites? Does a webmaster have a right to go in and edit (censor?) a site?

Internet Cluster Course

Spring semester, 1997, two of us (Kelliher and Webster) offered a cluster course on the Internet[2] at Westminster College. This course was supported in part by NSF grant DUE#9651206. Our goal was to develop cyberfluent citizens. A cluster course is a pair of courses from different disciplines that examine the same topic. The objectives of a cluster course are to investigate the connectedness of knowledge, demonstrate the ability to use concepts from one discipline in the pursuing the study of another, demonstrate the complementary nature of learning, and understand how the nature of the discipline affects the interpretation of knowledge and shapes the generation of data and the investigation of concepts[3]. In our case, the two disciplines were Computer Science and Psychology. The Computer Science focus was electronic networks, examining the Internet protocols, program development in the Unix environment using PERL (and in the HTML environment using JavaScript), and understanding computer and network technology. The Psychology focus was applications of theories of psychology to human interaction via the Internet, examining communication networks, group dynamics, cross-cultural values and human/machine interaction.

We used one syllabus, emphasizing both the connectedness of the course and the cluster itself. Students received two separate final grades, although during the semester some work was graded individually, some jointly. We scheduled the courses back-to-back on Tuesdays/Thursdays, giving us three full hours each day. Each of us attended, and was a student in, the other's class. This allowed us to maximize the cluster objectives by interjecting our individual perspectives and discussing differences and similarities. (It also maximized our time commitment.) Often, the distinction between the two classes blurred. Our own teaching/learning styles contrast, Webster is primarily top-down while Kelliher is bottom-up, giving the students the benefit of those two methods of learning.

We sought to have a class make up of 1/3 each Psychology, Computer Science, and "other" majors. The students would be working in groups consisting of a content expert (the "other") who would provide the group's project topic, a Psychology expert who would look to the project's social and perceptual aspects, and a Computer Science expert who would look to the project's "plumbing."

Realizing that we would have a diverse body of students with whom to work, we individualized the course to accommodate each student's strengths and needs. We did this by sitting down with the students (individually or in small groups) and discussing learning goals and tools to achieve those goals. For instance, one of the Computer Science majors had a goal of increasing his communication skills with non-technical people. Some students requested that we evaluate weekly summaries as a learning tool. Other students requested the option of retaking quizzes. These goals and tools were designed to decrease the anxiety felt by those students without a great deal of background in the material and also enabled those with strong backgrounds to advance further. This was quite useful, because some of the students were quite anxious about their skills at the beginning of the class. By the end, everyone was quite confident about his or her cyberfluency skills.

We continually took advantage of outside events in shaping the course. Webster received a new office PC during the semester and the class set it up. The Heaven's Gate suicides prompted discussions on cults and the Internet. The College's Academic Dean visited and related his views on group management and decision-making processes and his role in cleaning up Love Canal. The class used a bulletin board for asynchronous discussions. One day we received a posting from God. Someone noticed that God couldn't spell, starting a discussion on using critical thinking skills in analyzing online information. Kelliher put his class notes on the Web in HTML form, while Webster used PowerPoint presentations and Excel data stored on a shared drive and occasionally created in front of the class, thus sharing different ways of preparing and presenting online material.

We constantly broke the class down into small groups, with different members each time, to solve various problems in the lab. (We had about an equal distribution of lab time and lecture time.) We designed the groups to put students of different backgrounds and abilities together. This had the side-effect of ensuring that any student was comfortable with working with any other student, of asking a question, or of providing an answer. After a discussion of netiquette and notions of offensiveness, and group process, a group quiz was given in which the students had to devise an acceptable use policy for the network, citing the group process they used to design the policy.

We considered a number of larger issues as well. Consider, for example, social intelligence: reading and improving a situation[4]. There are no non-verbal cues in the online environment, how do we deal with that large loss of information in a social interaction? Computers and networking are a rather large tool. How do we decide that it's an appropriate tool for a particular problem?

Students developed home pages, paying attention to how they presented themselves in cyperspace, incorporating what they learned in class, and integrating the material of the two courses. For example, the home page assignment was given in the Computer Science class, but the home pages had to incorporate elements of Psychology (perception) that had been discussed recently. In particular, the students had to find examples of visual perception on the Web and include them in their home pages. The major focus of the course was the group projects. As stated earlier, the project groups were composed of a content expert(s), a psychology expert, and a technology expert. The content experts chose the topics for the projects. These topics were: resources for pre-school children, resources for grade school children, sorority home page, and biology resources. The content experts used local (people and the library) and online sources for locating information. For the school and biology projects, members of the Education, Psychology, and Biology departments were consulted. The psychologists were responsible for visual aspects of the site and managing the group interaction process. For example, the psychologist on the sorority project had to meet with individuals in the administration to determine how changes to the site could be made once the site was published on the College's official Web server. The technology experts were responsible for the nuts and bolts of the sites and for configuring specific tools for each site. For instance, the pre-school and grade school sites used embedded JavaScript to remove much of the browser interface to protect children from the Internet at large and provide an auditory warning when the site was being left. The sorority home page had a guest book and calendar.

The final exam involved group interaction and Web site design. The students found out what groups they were in and their exam topics at the beginning of the final, which lasted a scant three hours. Actually, they were to first write a PERL program to decrypt the file containing the project, as a problem solving exercise. What we did not forsee was that the students would realize that they could decrypt the file more quickly by hand, demonstrating their problem solving skills. Each of the four groups had a different problem to solve: geek speak, small group dynamics, creative problem solving on the net, and ethics of advertising on the net. For the most part, the students' solutions astounded us. It was clear that they had achieved cyberfluency.

Simultaneously, we were taking an exam created by the students for us. By this time, the students were able to out-maneuver us: the exam self-destructed five minutes after we had opened it. The first thing we had to do was re-construct it using our memory and the class bulletin board, where some of the questions had been posted while the students were evaluating the questions to include on our final. (The instructors received a grade of incomplete, as they did not answer the final question to the satisfaction of the class.)

Computing and Society

For the fall semester, 1997, the Mathematics and Computer Science Department at Goucher College offered a re-designed introduction to computing course: Computing and Society. Two of the authors, Zimmerman[5] and Kelliher[6], have taught sections of this course. The course description reads: "*Introduction to the principles and technical aspects of computing, as well as the many areas of social and ethical concern raised by the rapid evolution of computer technology. Topics include* *the Internet and worldwide information exchange, the power and limitations of the computer as a problem solver, and the issues of privacy, security, and computer crime. Parts of the course are devoted to an exploration of specific computer applications and the Internet"*[7]. The course focuses upon specific skills, such as searching for and evaluating information on the Web, designing and building Web sites, and understanding the issues involved in buying computer equipment. The course also focuses upon societal issues, such as privacy, security, and speech. Important components of the course include group projects, case studies, position papers, and discussions.

Sections of the course have varied greatly with respect to student's level of background. Some semesters, the students have had little prior exposure to computing while other semesters the students have had extensive exposure to computing. Determining a starting point can be difficult. We use a first day survey to gauge the class' abilities and to determine their interests. Exercises in a familiar application, such as a word processor, can be used to provide a starting point. Students turn in assignments electronically, and we distribute feedback electronically.

Search engines are one of our early studies. In small groups, we have the students use several different kinds of search engines so that they can see what's available on the Internet. This work also exposes them to Boolean algebra when they study advanced search techniques. We ask the students to compare the capabilities of various search engines and investigate techniques for reducing the number of "hits." Following this, we ask groups to examine a set of Web pages and determine their trustworthiness. From this, groups devise criteria for evaluating Web pages and share their criteria with the rest of the class and we attempt to forge a class consensus as to how to evaluate Web pages. As an exercise to complete this segment, students choose from a mixed list of truths and urban legends, trying to ascertain the truth of each of their choices.

A bulletin board is being used to encourage students to interact in cyberspace. We post questions or things we've read and others answer the questions or other otherwise respond to the postings. Small amounts of extra credit, up to a limit, are given for either posting or responding. Recently, we've had to put a user ID and password on the bulletin to prevent potentially offensive postings from outside. Occasionally, we get offensive postings from members of the class, which naturally leads into discussions of the differences in communication between real-time and cyberspace and free speech limits.

On the skills side, the next topic is Web page design. This builds on word processing skills, adding skills in image creation, scanning, and manipulation. Students enjoy expressing themselves through their home pages, so, often, they don't even realize they're learning skills. We look briefly at HTML, using it as an example of a simple programming language. This experience also allows the students to see the progression form command-line oriented computing to GUI-oriented computing and shows them what's going on behind the GUI. Students build a very small Web page (some text, an image, and a single hyperlink) using notepad and publishing it on a Web server by using ftp. The students build home page sites, determining how they will present their cyber-selves to the rest of the world. The manner of self-presentation needs to be determined at both the social- and electronic-network levels: What do I say about myself? Do I say it in images, sound, text, etc.? What do font choices say about me? Color choices? What experience will the person at the other end of the wire have? How fast is their connection? What sort of monitor resolution and color depth are they working with?

Some students have been reluctant to publish their Web pages because of privacy concerns. Some of their parents have raised the same concerns. Students and parents don't know who will be accessing the information presented and so want to protect themselves. This leads us into the second dimension of the class, societal issues. Computing and networks are quickly insinuating their ways into our lives. We are literally surrounded. Often, we don't consider that information is being collected on us, that it is being archived, or who's seeing it and how they're using it. We don't realize how it's propagating from one database to another. We discuss these issues often in class. We discuss how communication patterns have changed and the consequences. When before was it possible for us to put something "out there," whether it be text, images, or what have you, and have millions around the world instantly access it? What are the consequences of that? Something that I publish today may now be archived for decades. Do we adequately consider that? We need to discuss netiquette, to help our students avoid flaming or spamming others, and to understand how inhibitions can be relaxed, often for the worse, with online communications. Students usually don't know how to choose a good password and that they should keep it to themselves. They need to understand how quickly viruses (as demonstrated by Melissa) propagate today, why that's a concern, and what to do about it.

This class uses case studies and position papers as an effective tool for getting students thinking about these issues. The students read case studies and prepare a position paper before the class in which it will be discussed. Any position is acceptable so long as the case study facts and a valid chain of reasoning support it, further developing critical thinking skills. This is followed up by a classroom discussion that sometimes results in a consensus, but, more importantly, let's the students explore other perspectives of the problem at hand.

The final part of the course is a group Web site production project. This brings together all the components of cyberfluency, because the students are working in multi-disciplinary teams to design a Web site focused on a particular project. They use a networked share folder so that they can work independently of one another, when needed. Projects have included a Web site for the Harbel Community Organization in Baltimore (a service-learning credit option), Goucher College Myths and Legends, interactive children's sites, and a site documenting term paper mills.

Conclusion

We stand at the dawn of a new age --- the Information Age. Rapid change in how we produce, obtain, and use information will be the norm for quite some time. The amount of information produced is rapidly increasing. New technologies are providing us with new ways of working and interacting with others. These technologies hold the prospect of both bringing us together and isolating us[8] and even, perhaps, of one day surpassing us[9].

As a next step in the cyberfluency development of our students, we are currently examining the feasibility of teaching a distance version of cyberfluency between Goucher and Westminster. Direct student feedback is extremely important to us, so we must be very careful in the course's design. We hope that having one of us at each location will ameliorate this problem. With this extension, we are excited about the possibility of the class, in effect, studying itself.

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Using Virtual Reality models in the Curriculum

Dr. Steve Knode
Information Resources Management College (IRMC)
Ft. McNair, Washington, D.C. 20319
202 685-2070
knode@ndu.edu

Professor Jon-David W. Knode
Baltimore International College
Baltimore, MD 21202
410 675-6426
jdknode@hotmail.com

The technology of Virtual Reality (VR) has emerged to the point where universities can now begin to utilize this revolutionary technology in significant ways to benefit learning. Furthermore VR can be useful in the classroom for data visualization, data exploration or hypothesis testing. Until now VR has been primarily used by organizations which could afford a large expense for special hardware and software. Now the cost/performance factors have reached the point where many more organizations will be using VR in the classroom. In fact VR technology and cost delivery have progressed to the point where is it now possible (and affordable) for educators and students to develop their own useful models to use in the curriculum. Tools (such as 3D Webmaster from Superscape) now exist which: 1) run on today's personal computers without any special expensive graphics accelerators; 2) are inexpensive (some of it free); 3) are easy-to-use; and, 4) will allow models created to be distributed freely over the internet, making them useful in a distance education mode. This presentation discusses how these models are being used and how some of these worlds can be easily created by educators.

Introduction

Virtual Reality has quickly evolved into a much more affordable medium in which to develop applications due significant progress in several areas. First, hardware developments mean that what would have cost tens to hundreds of thousands of dollars to do now can be done to a large extent on modern personal computers, costing only a few hundreds of dollars. Likewise, instead of having to purchase, learn, and use complex and expensive software (usually involving heavy use of programming languages), virtual reality software now exists which almost anyone can afford and learn to use with minimal training. Tools, such as the 3D Webmaster package from Superscape allow for the rapid development of interesting virtual reality worlds by non-programmers. Further, these tools are affordable for the majority of users, including a free version for trial use. Finally, breakthroughs in bandwidth make the internet a more viable delivery vehicle for distributed use of virtual reality applications. The challenge now is not so much the "what" or "how" of developing virtual reality worlds, but more focused on the "so what" side of applications, i.e., now that they can be developed, for what purpose can they be productively used.

Virtual Reality allows us to visualize data rather than read it or listen to it or hear others tell about it. In fact, virtual reality allows us to "craft experiences", whereas in actual reality those experiences might be too expensive, too dangerous, too rare, or literally impossible to actually experience. The potential payoffs from this new form of interaction are just beginning to emerge, but might well include: 1) better understanding of the problem through improved data visualization; 2) increased ability to digest complex data necessary to solve the problem; 3) enhanced ability to test possible solutions to the problem prior to the implementation of these solutions; and, 4) cheaper development of prototype solutions. In each case, the key is the ability to make the data involved available to the user in a format more amenable to the cognitive processing power possessed by humans. These types of applications seem ideally suited for the educational process to incorporate.

Applications

Applications in the world of virtual reality are in several areas and spreading quickly. The primary areas where VR has had a significant impact already are the areas of medicine, manufacturing, education, architecture, scientific research, and entertainment along with the military. Many applications exist and can be discovered over the internet at www.superscape.com. The following are just some examples of VR creations developed with the Superscape software:

Exploration: Many virtual reality models are useful as educational tools. One interesting world is the one shown below, developed by the National Geographic Society to allow students to explore and learn about the Solar system. Visitors can start at any planet or the sun and see various aspects of the solar system in the virtual world.

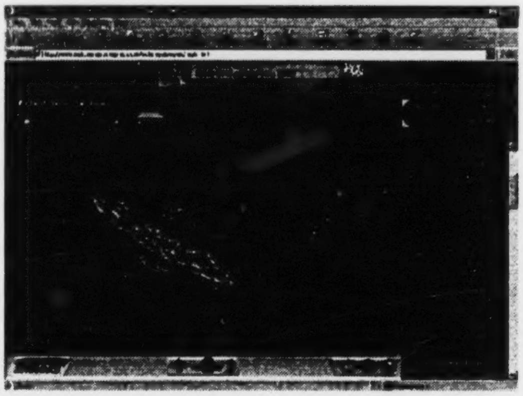

Fig 1: Solar System:727KB, created by National Geographic Society
http://www.nationalgeographic.com/solarsystem

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Design: Another educational application area for virtual reality is design. Using VR, students can experiment with several designs of items before actually commiting to one. This type of use for VR would be especially helpful in engineering classes or design courses. An example, again running on the web, is the virtual kitchen designer shown in figure 2. In this VR model, students can iteratively create a unique layout of a kitchen and determine actual dimensions.

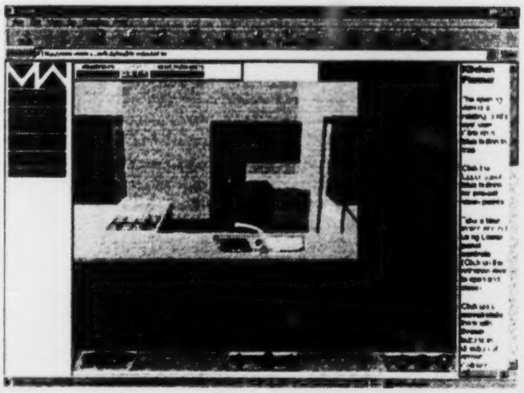

Fig 2: Kitchen Planner: 158KB, created by MW Design
http://www.mwdesign.co.uk/homefr.htm

Simulation: Using simulation is a powerful learning tool. Allowing students to repeat scenarios, varying parameters, often leads to insights into the problem at hand. One such VR world is a car driving simulation, wherein aspects of driving can be demonstrated without any reprogramming. Figure 3 is an illustration of this simulation.

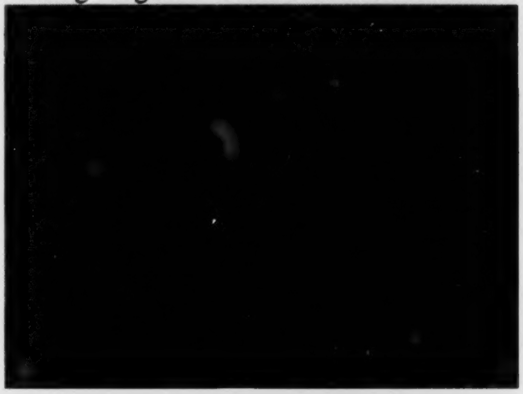

Fig 3: Driving Simulator: 78KB, created by Ismar VR
http://www.pvtnet.cz/www/czechvr/stream/sim-text/

Experiments: VR is being used in many ways to allow students to conduct experiments for which normal equipment or conditions are not readily available or too expensive. Additionally, VR allows for insights to be gained when the experiment involves a difficult concept to grasp. Several physics experiments have been designed using VR, as illustrated in Figure 4 below.

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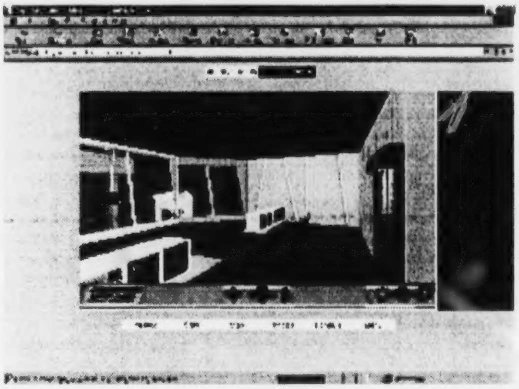

Fig 4: Physics Experiments: 124KB, created by Hi Tech Media
http://www.vr.co.kr/physics/main.html

Information/Understanding: VR can be a useful tool to allow for better data understanding in many arenas. The example in figure 5 is a VR toystore, developed by the European Community to facilitate understanding of the common toy safety standards now agreed to by the Community. Rather than just read the regulation, visitors can wander around a toystore and attempt to stay within the agreed upon toy standards by shopping smartly. At the same time, the actual regulation can be displayed in the frame associated with the VR world.

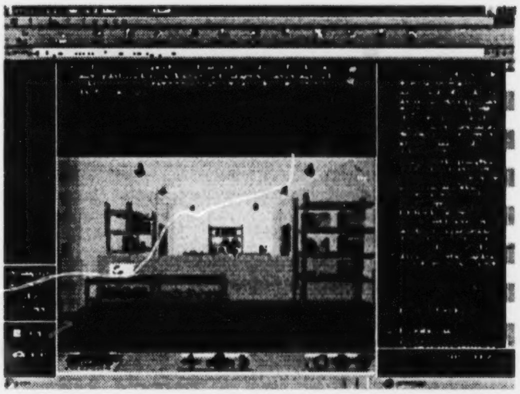

Fig 5: Consumerland: 205KB, created by DGXXIV
http://www.ispo.cec.be/consumerland/c en/accueil.htm

Architecture: Many virtual reality models are beginning to show up which allow for students to "experience" worlds that are not possible given the constraints of physical limits or resources available. One example, running on the internet, is the exploration of Stonehenge. In this application, visitors can view the development and changes in Stonehenge over time (e.g., at different eras), from different points of view, at different times of day, etc.

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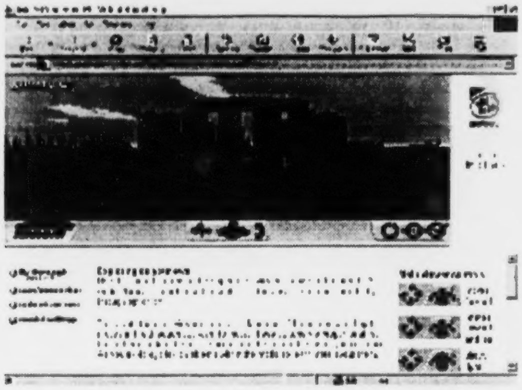

Fig 6: Stonehenge: 297KB, created by Intel
http://www.connectedpc.com/cpc/explore/stonehenge/model/index.htm

Entertainment: Many VR worlds are for entertainment. However, even these can be useful in getting students to become interested in a subject and stimulate their intellectual curiosity. Learning can often occur once interest is aroused. An example is the virtual cemetery shown below, in which hundreds of famous persons are "buried". Students can wander around and find out about any of the famous residents with just a mouse click.

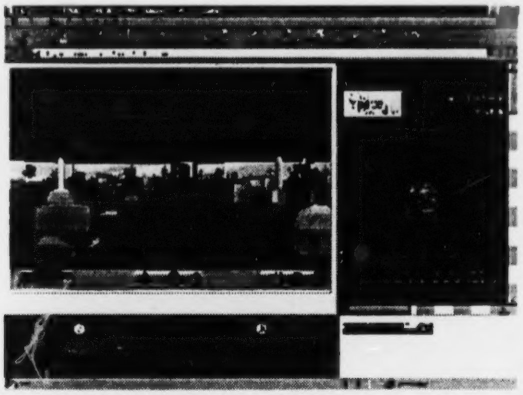

Fig 7: Tombtown: 77KB, created by Terraformers
http://www.tombtown.com/index3.htm

Bottom Line: As illustrated, there are many different ways to use Virtual Reality in the educational process. Shown are just a few of the many hundreds of worlds developed with the Superscape software. Other packages also exist which can be used, although the authors' experience has been that none are as easy to learn and use as the Superscape package. (More information can be found at www.superscape.com). Additionally, the superscape rendering engine makes distribution of the worlds over the internet extremely doable. Once distributed, anyone with the proper plugin can view and interact with the created worlds.

Recent additions to the software allow for multiple users via the internet to be in the same world and interact with each other. This adds to the ability of the worlds to seem real and enhances the utility of the worlds for distance education.

Summary:

The worlds shown here as well as many other worlds can be displayed over the internet or used in the classroom in a stand alone mode. The tools now available are remarkably affordable and easy to learn. The key challenges now are getting faculty and students involved in conceptualizing how to portray a learning objective in this new three dimensional medium. As faculty and students begin to grow into the usage of such tools, many exciting new ways of learning will be enhanced.

Effective Integration and Use of Technology in Teacher Education

Hamid R. Kobraei
Murray State University
College of Science
Department of
Physics and Engineering Physics
hamid.kobraei@murraystate.edu

During the past few years, we have witnessed many changes pertaining to the national education system. Kentucky, along with several other states, has forged ahead with educational reforms. Many of these reforms have centered around the K-12 curricula. KERA, the Kentucky Education Reform Act, has been the most significant impetus for transformation in Kentucky's school systems.

Science literacy is a major component of education reform. According to KERA, teachers are required to meet certain performance standards. Science education reforms call for teachers to provide quality instruction and introduce investigative, hands-on experiences into the classroom. Therefore, higher education has the responsibility of training future teachers.

The College of Science at Murray State University (MSU) has made a significant commitment to science education. Early on, the MSU College of Science recognized the manner in which KERA and National Science Education Standards (NSES) were transforming science education. In 1996, the College acted on the opportunity to create a course especially tailored to prepare preservice teachers to meet the more challenging demands of the science classrooms of today and tomorrow. The result was SCIENCE 101, a multi-disciplinary science course for elementary and middle school preservice teachers.

Below are the key directives of SCIENCE 101. They have driven both the design and the delivery of the course. It is upon these four aspects that the SCIENCE 101 course was built, and it is these four aspects that ensured its success.

- **Consistent with the NSES.** The influence of the National Science Education Standards and related publications (e.g., Benchmarks for Scientific Literacy, AAAS) on the science education reform movement and on KERA is unmistakable. The NSES provide both general guidance and specific suggestions related to the training of science teachers, the delivery of science instruction, the assessment of science instruction, and the scope and sequence of the science content for various age/grade ranges. Science is established as an active process in which the learner is a participant. A constructivist theme permeates the NSES. Alignment with the NSES is critical to course success.

- **Inquiry-based**. Even from a cursory reading of the NSES and a brief examination of the science teaching portion of the KERA Transformations document, it is abundantly clear that inquiry-based science teaching is a fundamental tenet of the science educational reform movement. Few university courses are taught in this manner. Few university students have experienced a significant exposure to inquiry-based learning during their college career

Therefore, today's preservice teachers have, at best, a poorly developed concept of the nature of inquiry-based teaching/learning and have rarely observed an effective role model, much less participated in an inquiry-based science course. It is imperative that MSU preservice elementary teachers receive a significant inquiry-based science learning experience. This can be accomplished in a course in which the content is organized as a series of hands-on projects, with the opportunity for student input in the planning of the investigations. In such a course, students learn and utilize the science process skills firsthand. Group work is now the norm with students experiencing how to function effectively as members of investigative teams. The learners become active participants, and lectures become discussions integrated as a natural part of the activities. At the same time, the content level remains rigorous.

- **Multi-disciplinary**. One of the fundamental aspects of the science education reform movement is the integration of science with other subject areas and the establishment of connections to several scientific disciplines. The traditional classroom delivered instruction in segregated dollops: mathematics, then social studies, followed by reading, and then science. Even within science teaching, physical science was kept separate from life science which, in turn, was isolated from earth and space science. Overlap was all but nonexistent. Today's science teacher is responsible for helping students not only learn science but also to identify relationships among different areas of science and links to other subject areas. A course with a strong multi-disciplinary approach is critical to the success of today's science teacher preparation. Connections to other subject areas and a rich mixture of biology, chemistry, geoscience, and physics are the necessary ingredients.

- **Theme-based**. A fundamental strength of any multi-disciplinary unit is that its goals are related to a common theme. The theme serves to unify the multiple facets of the course of study and strongly suggests that these diverse perspectives create a unique and enriching learning experience. Today's science education revolves around the exploration of theme ideas.

A pilot class of SCIENCE 101 was offered in the Spring semester of 1997. At this time, all three of the principal investigators were present in the classroom during each class meeting and shared the responsibilities of the pilot course. Most of the students in the pilot course were elementary education majors; but we included a few students in this class, mainly from secondary science education majors, who were training as teaching assistants for the next semester. We selected, adopted, revised, and developed a series of projects for the course under *The Earth System* theme with content consisting of stellar evolution, the earth/moon system, the heat machine, chemical evolution, atmospheric change and its evolution, biological evolution, etc. We believe that the topics and the projects of the course should be revised according to the needs of the students, regions, and the institutions, while the characteristics of these courses remain the same. The initiation of the pilot project had several benefits:

- It allowed all principal investigators, who are from different disciplines in the sciences, to participate through all projects.

- It gave us the opportunity to collaborate and help one another.

Experience in the pilot project was used to determine the number of students we could effectively serve in each section of the class.

- It provided a unique practical or practitioner experience for prospective high school teachers who are involved as teaching assistants.
- Experience from the pilot class was used to refine the content and projects of the course.
- Computers and other current technologies were integrated into our investigative projects.

SCIENCE 101 is now institutionalized as a regular course offering at MSU. It has been approved by the MSU Academic Council and will be included in the regularly published catalog of undergraduate courses. Because of its scope and intensity, it is now a required course for incoming freshmen elementary education majors.

Although similar in general design to SCIENCE 101, the SCIENCE 102 course will have a different theme. The two courses will also cover different science content areas; thus, neither will be a prerequisite of the other. By taking either course, an undergraduate student would gain hands-on experience with the inquiry process of science and would learn a substantial amount of content. This is sufficient for success in the senior level science methods practicum courses in the MSU College of Education. By taking both courses, a student would gain a well-rounded content background as well as extended experience in the scientific processes.

Many programs of study in other MSU colleges require two science courses. Having both SCIENCE 101 and SCIENCE 102 available would provide students in these programs with an attractive option in lieu of taking more traditional science courses.

The unifying theme of SCIENCE 102 will be "Systems of Communication." The content will focus on the structure and functions of the biological sensory and nervous systems and the physics of sound and electromagnetic radiation (radio, television, etc.) as different systems of communication.

Computer and information technology is an integral part of the projects. Efforts are made to utilize the computer interfacing, data acquisition, and data analysis as a part of the assigned projects for SCIENCE 101 and SCIENCE 102. There are packaged programs and interface boxes available by few vendors. These boxes and their accompanied software have been already tested and configured. They are ready to be interfaced into computers with the minimum input from the end users. When they work they are very convenient and reasonably accurate. However in the case of a problem, it is very difficult to find out what has gone wrong and where it has occurred. The main problem is when a student who is not an experienced computer user faces difficulty with these programs and interface boxes. In that case, most of the effort will be directed toward figuring out the program and the interface box. Consequently, the scientific concept and its application won't get enough attention. Moreover, the significance of the concepts and most of the difficulties of experimental procedures are usually hidden from the end users. This is probably the major disadvantage of these boxes and programs, although the use of packaged programs and transducers really saves a great deal of developmental time.

Brief Descriptions of Projects

Making a Hypothesis

This experiment is designed to let students form a hypothesis using a black wooden box. The box is designed similar to a box which was marketed as a laundry detergent container that would deliver the appropriate amount of soap every time. The students were asked to fill and empty the box as many times as necessary to determine whether the box worked as the company claimed and to hypothesize about how the box worked. The students were not told how the box worked nor were they given additional information even at the conclusion of the experiment. This demonstrates the methods used by scientists who, consequently, may never know conclusively about their hypotheses.

A Core Sample Model of the Earth

Each group was instructed on relationship between mass, volume and density. After a discussion about the structure of the crust, core, and mantle of the earth, the students determine the mass, density, and depth of the layers of the earth. Then, using information in the discussion, the students construct a test tube model of the earth. The model is made of iron powder, water, and vegetable oil. The amount of each material is determined by the relative mass, volume, and radius of each layer as compared to the entire radius of the earth. It is easily seen how the iron catastrophe generated the layers by simply shaking the model and viewing it after settling. Students are also asked for innovative ideas on how to clean up the test tubes and salvage the iron powder.

Radioactive Decay

Included in discussions about the formation of early materials in the universe, this experiment demonstrates the process of radioactive decay. A bag of 100 red and red/black chips, representing the parent atoms, are tossed onto the table. Each toss represents a half-life. Each chip that lands solid red side up represents decay and is removed and replaced with a green chip. The green chips represent the daughter atoms. The results are recorded and the chips are re-mixed and tossed again. The pattern that develops is clear: approximately half of the solid red chips are replaced with each toss.

Relative Geologic Ages

Using modeling clay, students are asked to construct a model of layers of the earth. Each group is asked to use information discussed about relative dating of materials in the earth and Laws of Relative ages, then to explain their model.

Energy for Life

The purpose of this experiment is to quantify the process of photosynthesis and cellular respiration. Two sets of isolated specimens of Elodea and goldfish, and specimens containing Elodea with goldfish are placed in glass jars. The jars are filled to eliminate excess oxygen. A baseline measurement of dissolved oxygen and pH in the original aquarium water is recorded. One jar of each specimen type is placed in direct light while another is placed in the dark. After one hour, dissolved oxygen and pH readings from the jars are recorded. By comparing readings of the jars with each other and with the original data, students should be able to determine what processes have occurred in each jar. Using information from lecture, the students will know how dissolved oxygen and pH readings are related to photosynthesis and cellular respiration. Students should also be able to form predictions about the experiment if the reading times are extended beyond one hour.

Electrolysis of Water

Electrolysis of water is performed using a kit and a solution of Sodium Sulfate. The kit is connected to a 6-volt battery. The students then collect the liberated gases in a test tube. Using a lit match they determine which gases are present at the cathode and the anode. Information given by the instructors allows students to describe the process in terms of polarity. This experiment relates nicely to the chemistry of water experiment.

Relationship of Temperature and Density of Water and Acetone

Using a known mass of water and acetone, each substance is placed in a graduated tube. The temperature of each is raised (or lowered) and volume readings are recorded at even temperature intervals. Students then find the density of the water at each interval and plot the relationship between temperature and volume for water and for acetone. This experiment enables students to draw conclusions about the differences in water and acetone and their chemistry.

What's So Special About Water

This is a seven-part experiment designed to demonstrate the unique properties of water. Part A asks students to rub a glass rod with a piece of cloth and place it near a stream of water. Using their observations and knowledge of the chemistry of water, students are to explain the behavior of the water. Part B is a demonstration of the difference in surface tension (and adhesion and cohesion) of water and alcohol. Students place a drop of each on a clean microscope slide. The students note the differences in behavior of the water and alcohol and they provide explanations on these differences. Part C deals directly with the surface tension of water. A straight pin is placed on one side of the surface of water in a petri dish and a drop of soapy water is placed into the other side. Students are asked to explain why the pin stays on the surface until the soap is introduced into the water. In Part D of the experiment the students place glass tubes of various diameters into a beaker of colored water and explain the rise of the water level in the tubes in terms of capillarity. Part E is a demonstration of the high specific heat of water. A flask of water and an empty flask are heated and then allowed to cool. Temperatures and times are recorded and data are plotted by the students. The students explain the relatively slow cooling of the flask of water. Part F uses colored ice, warm water, and cool water introduced into a large beaker to illustrate the densities of each. The students should note the lesser density of the ice and explain the behavior of the water in terms of its chemistry. The final portion of the experiment asks the students to describe how all the demonstrated properties of water are important in nature and to provide specific examples of each.

Intensity of Light

To confirm for students the inverse square law for the intensity of light, a high wattage light bulb and a radiation sensor are provided. The students use a meter stick to record the distance of the bulb from the sensor as well as the corresponding intensity reading. The students then can plot the data and see the relationship.

Applied Geology: Topographic and Geologic Maps

An extensive workbook is used to teach students about topographic and geologic maps and their uses. The students complete exercises on map interpretation, contouring, calculating depth to aquifer, elevation, directional analysis, and topographic profiling. Ultimately the students use these techniques to determine suitable water well sites.

Permeability of Different Earth Materials

Students are given a number of different samples of gravel, sand, and clay. After learning about grain size and sorting, they run a measured amount of water through each sample and record the time it takes for water to penetrate the samples. The students then can draw conclusions about grain size and sorting of earth's materials and the effect permeability has on aquifers, pollution and other environmental concerns.

How Substances Move In and Out of Cells

In this experiment, students use a drop of blood and a piece of Elodea to observe osmotic effects. Slides of the animal and plant cells are treated with solutions unknown to the students. These solutions cause hyperosmotic, hypoosmotic, and isosmotic conditions. By observing these slides under microscopes, the students determine which solutions cause which situation as well as describe what they see under the microscope.

Oil Spills and Logistic Bacteria

In this computer simulation experiment, students use concepts of predator-prey relationships and population distribution to determine the best solution for an oil spill. The scenario is that a company wants to produce a cost-effective plan for introducing bacteria into an oil spill to eliminate the spill. Students must balance cost, population size, life span, and appetites of different bacteria. They run simulations and determine the best solution to the problem.

Keystone Predator

In another computer simulation experiment, the students use their knowledge of food webs and predator-prey relationships to determine the keystone predator of a simulated ecosystem. The species in the populations can be turned on or off and the growth and stomach contents can be analyzed. Using the variables of the program, the students can determine which species in the keystone predator of the population and can construct a food web.

Genetics Construction Kit

In this experiment, the students use a different computer program to understand genetics in a basic form. Each student or group randomly receives a species with certain traits. The individual traits can be crossed at the discretion of the student. The results are then displayed. By varying the cross breeding and analyzing the outcomes, students are able to determine dominant traits and whether or not these traits are sex-linked.

Genetics Case Study

Students are presented with a murder case. They must use their knowledge of DNA fingerprinting to determine if the suspect is guilty or innocent.

Mitosis and Meiosis Kit

In this hands-on demonstration, students use a kit to understand all the steps of cell reproduction. The kit has various pieces representing all participants in each step of reproduction. Students are asked to work with the kit until they feel confident and then to demonstrate the process for the instructor or teaching assistant.

Today's Weather

These activities combine the analysis and interpretation of surface weather charts and the station model for common weather variables such as temperature, barometric pressure, wind direction, sky cover, and current precipitation. The atmospheric conditions favorable for severe weather such as lightning and tornadoes, are explored by utilizing the documentation for the Andover-Wichita tornado of April 26, 1991.

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Meta-Learning Digital Library Initiative City University of New York

Michael E. Kress and James W. Marcum
Computer Science Department
College of Staten Island
City University of New York
2800 Victory Blvd. 1N-215
Staten Island, NY 10314
kress@postbox.csi.cuny.edu
(718) 982-2850

The College of Staten Island, CUNY, seeks to improve the quality of our technological support of teaching and learning to a new level, one that better encompasses video media. One result of this effort is that CSI people are taking a leading role in a collaborative City University of New York endeavor to seek major funding for a comprehensive initiative addressing several issues and problems in utilizing technology effectively to support instruction and learning on the campus today.

THE PROBLEM

The problem has several key components:

1. Digital Generation. The typical college campus is in danger of falling behind the wave of digital technology, particularly in the ability to capture and use video and other forms of continuous media (CM). We serve a generation that has "grown up digital," to quote Don Tapscott, an age long acknowledged as the "MTV generation." Print is less important, less central to the learning (and everyday) activities of many of our students, particularly the traditional 18-24 age group. Print remains, however, the dominant medium for classroom materials and assignments. A ballooning "disconnect" between traditional academia and mainstream students threatens. The campus must move decisively to develop capabilities to incorporate CM into our routines.

2. Digital Library. The central focus in the highly visible shift toward the digital library has been the digitalization of print materials. Leading endeavors, like Project Gutenburg and JSTOR, have initiated the task of converting valuable print resources into digital formats to make them readily -- and widely -- available over the Internet. (Lyman) Non-print media, such as audio and video formats, have received much less attention. Our understanding of the "digital library" must expand to encompass CM more comprehensively.

3. Academic Libraries. Most college libraries, in particular, are not cognizant of the need to incorporate CM into their holdings and capabilities. Most remain somewhat passive, holding to a mindset that is print-based, preservationist, and content-repository in intent. (Davenport) Excursions into the morass of developing competencies in accessing, cataloging, and supporting student use of CM are urgently needed even if not yet generally recognized.

4. Technology and Learning. The use of CM to provide alternative means of supporting more visually oriented learning styles needs to be explored and tested. We are gaining confidence that technology can enhance learning. Learning is displacing instruction as the focus of attention for higher education. It is time to investigate the power of visual media for learners. The means are at hand for undertaking the task.

The City University of New York is one of the largest institutions of higher learning in the nation, noted for serving a diverse student population. Conveniently clustered in the New York City area, CUNY consists of 19 separate institutions including several community colleges, senior colleges, and a graduate center. CUNY provides a rich test case for the economies and synergies of technological collaboration and experimentation.

THE PROJECT

CUNY is pursuing funding from a variety of sources to implement the Meta-Learning Digital Library Initiative described here. The Meta-Learning Digital Library (MDL) will be a network of library-based entities designed to gather, catalog, manage, and distribute continuous-media resources. A distinguishing characteristic will be the capacity to access and manage digital print or graphics or continuous media. The backbone of this capability will be a network of high-capacity video-on-demand (VOD) servers. The design and purpose of the MDL is to facilitate student learning regardless of their learning styles and capabilities.

The first order of business will be the installation of a unique learning milieu, specifically, PC-based learning laboratories known as Digital Learning Centers. We plan to begin with two such labs, one at the College of Staten Island and the other at Kingsborough Community College in Brooklyn. Preliminary plans include the addition of at least three more Digital Learning Centers. Figure 1 provides a schematic representation of the Distributed Digital Learning Centers.

The equipment and resources employed in each center will include a powerful video server with high-density storage, a real-time MPEG2 video compression system, desktop media editors, digital media management tools, CD-ROM writer workstations for producing customized databases, along with scanners, OCR software, and digital cameras.

The basic function of the VOD network is to make available a full motion video stream (MPEG) to the desktop PC allowing the end-user to either view or imbed the segment into their document. The Video Server contains compressed video programs and provides on-demand copies of requested items to the user. The server also contains real-time MPEG decoders for accessing live programs. The components must be added to existing media distribution infrastructures. The source of the videos, or CM, could be DVD, VHS, film, television, laser disk, or other media. The underlying functionality of the VOD is to make the original format irrelevant and convert any medium to a standard digital format (MPEG). Additionally, since these labs and workstations will be networked, they will enjoy wider access to resources as well as the Internet, CD-ROM servers, and the like. The Headend equipment at CSI, Kingsborough, and other CUNY campuses facilitates this capability.

The project involves a network of CM/VOD servers, switching elements, access elements, scheduling and management components, and various means of distributing and producing compound documents. This facility will encourage faculty, student and librarian researchers to collaborate as partners in the pursuit of new knowledge. Located prominently in respective libraries, these Centers will provide powerful PC workstations designed to facilitate the process of accessing, capturing, manipulating, and utilizing resources on SMET-related learning in whatever formats they exist. For example, we will endeavor to locate and catalog:

- the findings and reports from completed and ongoing CUNY-based research projects
- relevant CUNY resources, particularly TV programming on scientific subjects
- electronic journals in the sciences
- particularly effective multi-media courses and modules in the sciences available through educational networks, the Internet, and from commercial vendors (Note: all appropriate care will be given to the protection of copyright materials)
- reports and findings of select relevant NSF-sponsored projects and demonstrations.

The general problem of managing such diverse, extensive, and multi-media data will be addressed by the use of software described as Digital Media Management tools. Digital Media Management (DMM) is the development of a centralized repository of all formats of multi-media resources, processes for loading and cataloging these resources, and the means for accessing the content. (Rosenblatt) DMM:

- Integrates all formats of media
- Automatically catalogs the data
- Makes the data accessible to the desktop workstation
- Allows access to the data without learning special files or protocols
- Utilizes popular software for content creation
- Fosters re-usability by allowing easy conversion among formats.

Other software will be needed to schedule media delivery and manage complex throughput problems. (To)

This initiative is based in academic libraries, at least in its initial stages. There are good reasons for this. It is known that many students are poorly prepared to take advantage of available electronic information resources. Their searching techniques are ineffective, and their conceptual structures and vocabularies are often inadequate to support full exploitation of the burgeoning resources that are available. Librarians and a nurturing environment can affect the knowledge and behaviors of students in this regard. (Neuman)

A few words of clarification and explanation are in order. This is more than a technology project; this is a learning project. It is the human behaviors and learning that are the focus, not the technology. The involvement of librarians at the heart of the process is intended both to utilize their expertise in accessing and managing information, and to develop new skills in accessing and managing digital media, especially CM, to face the challenges ahead.

Finding, accessing, and effectively utilizing appropriate digital, CM resources will be a long-term challenge for the academic community. The library profession is debating whether it can appropriately catalog the Web, for example. Significant efforts to describe and catalog materials in various formats -- sometimes called metadata -- are well underway, with the Dublin Core project leading the field. (Oder)

Several other characteristics of this initiative include a focus on science, math, engineering and technology topics. This is in keeping with an important focus of CUNY and an acknowledgement that academicians in these fields generally are more technologically competent and often more interested in experimenting with new technologies.

CUNY regards this initiative as a "testbed" project rather than a research project. The emphasis is on testing and comparing different materials, approaches, and techniques in the quest for learning effectiveness. The goal is not to demonstrate the effectiveness of a given method or resource, but rather to pursue various theories and techniques while maintaining the flexibility to abandon one method and pursue another intensively, or sporadically. For example, issues such as "concentration versus infusion" might be explored productively. Should information searching be taught as a separate, disciplinary, course with a set of tools and group support, or by means of a learn it/use it, asynchronous, in-service training approach?

The operative "theory of learning" in the MDL falls into the constructivist school. Cognition, participation, self-determination, and collaboration are all encouraged as proper means of promoting learning for some students. We now know that all students do not learn in the same manner. Alternative routes to comprehension and visualization - which might come from a picture for one, a peer consultation for another, from collaboratively solving a problem for a third, or as a result of group discussion for a fourth - assure that more varied learning styles can be accommodated, all of which can be enhanced by the computer and telecommunications technologies. The idea is to enhance formal classroom training with support for informal learning by facilitating peer tutoring and collaborative learning. (Breivik; Kasabov)

Collaborative leadership will be another hallmark of the initiative. Subject specialists, librarians, information and computer specialists, as well as learning support professionals will all have a role to play. We anticipate that the collaborative learning of groups of faculty, librarians, and students in the common task of discovering and utilizing multi-media resources for learning about the scientific process will nurture the development of new communities of practice that foster the spread of this methodology. (Tompkins) For example, one of the leaders of the project teaches library and information science and is an expert on searching behaviors of students, both individually and in groups. (Cool)

The links between digital media, the power of the PC, and learning will be explored. The processing power of the computer, its capacity to use and manipulate the various media, makes it a central factor in the new learning. Where the use of the computer needs improvement is in the social dimensions of learning and its adaptability to the needs of the instructor in the classroom. (Kozma, 1994) The computer can mediate and juxtapose between various media, and multiple media can now be accessed and managed through a single device rather than multiple types of equipment. The computer can assist in tracking and monitoring the learning process. (Kozma, 1991)

The power of the project will be demonstrated by the number and quality of programs produced by participants in the initiative. Accessing CM is pointless unless the material can be utilized, practically and effectively, by both the students and the faculty involved in the project.
Accordingly, multi-media software and CD-ROM printers will be an essential component of the exercise. Multi-media presentations, easily captured, demonstrated, and disseminated via CD-ROM media, will characterize the product and progress of all participants. Paper and print reports by students, and traditional instruction by faculty, will recede in favor of multi-media presentations. Presumably, increasing quality of these presentations will demonstrate the power of the technology

and the learning environment.

EVALUATION AND DISSEMINATION

Participation in this project will require, of teaching faculty, librarians, and students alike, a pretest of their digital information- and media-literacy skills. Progress-marking "post-tests" will also be administered, making available a concrete measure of longitudinal growth of expertise in the topic. In addition, the program administrator will keep copies of CD-ROM prints produced; these will provide tangible, quantitative evidence of the growth of expertise resulting from the project.

Additional measures to be tracked include user satisfaction indices, utilization statistics (both the number of participants in the DLC and the number of sessions of each), and the persistence of students in taking the next course in the sciences compared with students not trained in these capabilities. By correlating progress in this technological competence with MDL utilization rates and persistence factors, a measure of the efficacy of student engagement with the subject and the methodology can be developed. The significance of CM management capabilities for teaching and learning may be substantial.

Various products of this study will be dissemination in different ways.

1. The guides, explanations, and summaries completed by the Library and the participants of the program will be compiled and posted on library Web pages.
2. Reports and publication on the project will be presented to relevant associations, such as:
    - The Association of Small Computer Users in Education
    - The Association for the Advancement of Computing in Education
    - The American Society of Engineering Education
    - The Association of College and Research Libraries, and others.
3. Support will be sought for a conference to present the findings of this project and to share insights and understanding of the linkage between utilizing digital information and engagement in learning.

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Setting Up and Administering Mathematics Department, Windows NT Network and Laboratory

Richard Kuntz
Monmouth University
West Long Branch, NJ 07764
(kuntz@monmouth.edu)

Abstract:

This paper discusses issues involved in the design, development, implementation, and administration of a computer network and student laboratory for the Mathematics Department. It focuses on the concepts that were used to minimize on-going administrative tasks. It includes a discussion of user polices and privileges, directory structures and permissions, and faculty authority and responsibilities.

During the spring and summer of 1998, the author began to design and implement a Windows NT® computer network to meet the needs and requirements of the Mathematics Department. The Department had adopted the goal of infusing technology into the entire curriculum. Technology was defined in terms of computers and computer software systems. The software component included the three major areas: computer algebra/numerical calculation systems, geometric visualization/graphing systems and data collection/analysis systems.

The network and laboratory infrastructure was designed to support both faculty and student needs. The two principal design goals were: robust/secure systems and ease of use with individual control for faculty members.

The network became operational with the beginning of the Fall 1998 term. It consists of a twenty-five (25) workstation student laboratory, a four (4) workstation mathematics skills tutoring center, and ten faculty office workstations. The infrastructure is supported by a Windows NT® 4.0 server with all attached workstations operating under the Windows NT® 4.0 workstation operating system. The network also supports 5 print stations that are using the direct-network TCP/IP printing. Network, server, and workstation administration is performed by personnel in the Mathematics Department, while the University Information Systems Department performs hardware and wiring support.

The presentation will conclude with a summary of lessons learned and a discussion of plans for the future of the network and administration.

Instructional Setting:

Monmouth University is a private, comprehensive, teaching university enrolling approximately 4500 students of which 3200 are full-time undergraduate students. The University is located in the central shore area of New Jersey – about 55 miles south of New York City.

The Mathematics Department of the University has ten full-time faculty members. The Mathematics Majors program at the University enrolls about 50 full-time equivalent students; a significant number of those students are dual majors - mathematics and education. As with most institutions of today, a substantial part of the teaching responsibility of the Mathematics Department at the University is directed toward instruction for non-majors with many in the non-science disciplines. The largest single population serviced by the Mathematics Department consists of those students majoring in programs within the Business School.

The University has a computer network, called HawkNet, with a fiber optic backbone that connects all academic buildings including the library and the twelve residence halls. Students residing in the residence halls may subscribe to a network connection on a no-charge basis. There are 20 "public" computer laboratories in size ranging from six to thirty computers, and an "Information Commons Area" in the library. One of the computer laboratories is located in one of the new residence halls. The other residence halls contain at least two public accessible computers in the lobby. All of these facilities are accessible to students and support access to the campus network and through the network, web access. The University supports a modem pool for dial-in access and a T1 link to an Internet Service Provider.

As of this writing, all but a few of the 185 faculty at the University have a PC on their desk. Except for the Computer Science Faculty who have SUN Workstations and the Art Graphics Faculty who have Apple Macs, most of the faculty systems are Pentium class units. All are connected to HawkNet and most are running Windows 95 with the standard productivity tools (either Office 95 or Office 97) along with Netscape.

Problems Addressed by the Mathematics Laboratory

The IS (Information Systems) Department at the University is responsible for administering and supporting the 20 computer laboratories. Those responsibilities included the full range of activities from hardware, software, and network infrastructure. In order to manage the totality of activities, the Department instituted a standard set of practices, procedures, and environments. The individual components of the standards were designed to satisfy the largest possible constituencies. These standards included: workstation operating system, networking protocols, server administration and control, software updates, formal application process for access to specialized software, and trouble reports.

The standard computer laboratory environment consists of Windows 95 workstations (Pentium 120 class or higher), networked to a Novell 3.1 server using the Windows 95 NWLink protocol. A template image is created for each distinct laboratory environment and stored on the Novell server using the *Ghost* (http://innovativesoftware.com) software product. At each system boot, the directories and files on the local workstation are synchronized with the template and updated as appropriate using a software product called *PC-Rdist* (http://www.pyzzo.com). A considerable amount of network band-width is used during each system reboot. Most individual workstations are not connected directly to a high-speed link to the server, but rather to a 10 meg shared segment for the entire laboratory. In the best case scenario, that laboratory 10 meg link is connected to a high-speed switching hub or segment router that completes the connection to the server. Rebooting an entire laboratory to synchronize the environment during a class session is untenable.

The Mathematics Laboratory is required to function both as a open laboratory, providing students with the specialized software, and as a teaching laboratory, supporting formal laboratory sessions similar in philosophy and use as a traditional physical or chemistry laboratory experience. Laboratory Assistants are assigned to the facility approximately one-quarter of the time the facility is open. In most cases, those hours are scheduled for the times the formal laboratory sessions are scheduled. The assistants function as an extra set of hands to assist the instructors during the laboratory sessions. There is a considerable amount of time that the laboratory is unsupervised.

In general, the constituents using the Mathematics Laboratory are not expected to be proficient in basic PC diagnostics and workarounds. That is, if an expected icon is missing (e.g., the desktop Maple V icon), they are not expected to know where to find the program. Or if a network drive mapping fails, they are not expected to know how to reestablish the connection. When an application hangs up, they are not expected to know some of the workarounds that may get the system functional again. The standard practice becomes -- reboot!

In order to support the Mathematics Department goal of integration of technology throughout the curriculum, faculty needs to control their own resources in terms of directories, files, shares, and read/write access. In general, faculty needs to be presented with a network environment that is consistent with the local desktop model. Individual faculty administering network resources at the user level is troublesome. It has been difficult to have individual faculty take responsibility for that feature. They need to get examples, assignments, and worksheets in the right place with the correct access permissions without any hassle. In many cases this is just before they go to class.

In essence, the general (one size fits all) standards and practices of the IS Department do not adequately support the needs of the Mathematics Department.

Design Goals for the Mathematics Laboratory

The design goals for the Mathematics Laboratory were rather simple and in some respect, obvious. They were:

1. Provide an environment with the capability of controlling user (both student users and faculty users) access to resources -- program execution, data files, directories, and disk read/write operations.
2. Provide an environment that facilitates individual faculty control over their files, directories, and read/write permissions.
3. Provide an environment that is robust to the extent of dramatically reducing (if not totally eliminating) the wasteful scenario -- system hang-up, reboot, wait, start-over.
4. Provide an environment that is consistent -- always the same when students sit down at the workstation -- appropriate icons are on the desktop, network drives are available, and executables are available and functional.
5. Provide an environment that will minimize the amount of administrative support in terms of time and dollars.

Description of Networking Environment

Faculty members in the Mathematics Department have, at least, Pentium P133 systems. The Department has standardized on Maple V as the mathematics symbolic algebra language. In addition to the standard productivity tools, all faculty workstations have a copy of Maple V installed locally on their systems.

The Mathematics Department computer laboratory contains 25 workstations networked through a 10 Meg, 3Com Super Stack switching hub. The workstations in the laboratory are 133 MHz Pentium computers with 32 Meg of main memory. Most of the laboratory software resides on the local hard drive. The laboratory workstations are connected to the Mathematics Department server through a 100 Meg port on the switching hub.

The mathematics server is running Windows NT 4.0 with the latest service packs and fixes. It is administered locally by the Mathematics Department and acts as both a file server for individual faculty files, some of which are made public and are publicly available in the laboratory; and it also serves as a "web" server for Mathematics Department information and faculty course notes.

Implementation Procedure

As part of Integration of Technology Initiative, the Mathematics Department was able to add computer laboratory fees to several of the courses. The University Policy on laboratory fees returned a portion of such fees back to the Department as a "Budget Supplement." Consequently, the Department was able to develop plans to acquire hardware and software to implement a server environment that would be administered by the Department. Since the funds were available and were intended to provide the department with a means to experiment with new ideas and technologies to support the mission of the Department, it was a relatively easy matter to obtain support from the administration to begin experimenting with a department administered server. It is unlikely that the concept of a department administered server would have been realized if the concept required an allocation of general funds. All regular budget funds for computers and related items are administered through the IS Department after general allocations are made at the President's Cabinet level. Since the IS Department was not exactly enamored with the thought of losing control over environments and standards, it is unlikely that any academic budget unit (provost or dean) would have reallocated funds to such a project.

With the allocation of the Budget Supplement Funds in the Spring 1997 and with the Dean's support, an agreement with the IS department was reached which permitted the experimentation with a department server. The initial agreement was for the establishment of a server that was connected to the campus network and provided Intranet Web support for department notes and course syllabi. In addition, the workstations in the Mathematics Laboratory (at that time they were operating under the Windows 95 operating environment), were configured to map a drive to the server so that faculty could make available course materials (most in the form of data files and application templates) that could be accessed by students in the laboratory. As one could predict, the robustness of the server out performed the robustness of the Windows 95 workstations in the student laboratory.

With the support of the IS Department, a move was made to implementing policies on the Windows 95 workstations during the Fall 1997 term. That implementation did require some configuration changes and some compromises with regard to resources that were to be available in the laboratory. Prior to that time, IS policy had required that all student laboratories have similar configurations (provided sufficient hardware was available). In particular, connections to Novell servers were eliminated, since the Mathematics Laboratory did not require any of the resources that were on the Novell Servers. In the Mathematics Laboratory, the Novell Servers were only used as print servers, which because of the 10meg network configuration and the total print demand on the Novell servers were, to say the least, problematic. The print server concept was replaced by direct TCP/IP printing to a network lantronics print server box. In addition to permitting the separation from the Novell Servers, the TCP/IP printing substantially improved print service for the Mathematics Laboratory.

Even with the movement to policies administered through the NT Server, the vulnerability of the Window 95 environment in a student laboratory caused considerable stress. The units would lockup--requiring reboots; students would delete or change critical files--sometimes just for kicks; students would bypass the logon process--thereby not establishing network connections; and students would replace standard desktop icons with their favorites--thereby taking computers out of service for those students who didn't know how to find the resources; and students would password protect the screen saver--thereby taking the computer out of service.

Server Configuration

The server is a Pentium 233 box with 96 meg memory, 3com 10/100 meg network card, two SCSI drives attached to two separate controllers (one is a 4 gig and one is an 8 gig drive), and a Seagate SCSI Tape Backup System. The initial software was Windows NT 4.0 (with SP1) and IIS 2.0. The environment has been upgraded to SP4 with IIS 4.0. This server functions as the domain controller, file server for faculty files (some of which are intended to be accessible from the workstations in the Mathematics Laboratory, and Web Server for the Mathematics Department materials and class notes. At any given time, 30 to 40 users are connected to the server.

The two disk drives are NTFS formatted and are partitioned into two equal segments. The boot drive (a 2 gig partition) contains all the operating system software as well as such inherent core system applications such as IIS, the NT Server Resource Kit, and administrative tools such as Hyena and Regeditx. The second 2 gig partition contains the Web files. Faculty directories and files are contained in the first 4 gig partition of the 8 gig drive. The remaining partition is allocated to on-line copies of software. Directories exist for most application software. These directories provide for network access for installation of software.

Each faculty member is provided with two main directories on the server. One directory, under the share named *users* and identified by the faculty person's name, is for notes and files that are accessible from the computers in the Mathematics Laboratory. Normally, those files are templates or data files to be used as source material for student exercises in Maple, Excel, SPSS, and Minitabs. These files are only available in the Mathematics Laboratory. The other directory is under the share named *webnotes* and identified by the faculty person's name, is for the distribution of course material over the Web. These materials include course notes, study guides, and homework assignments. The Web materials are part of the University Web structure and, as such, are accessible from any computer that has Internet Web access. The URL of the Mathematics Department materials is: "mathserv.monmouth.edu"

Each faculty directory under the *users* directory contains a public and private subdirectory. By default, those directories have been configured so that only the individual faculty member can access the private subdirectory -- all other domain users receive an "access denied" message when attempting to access the private directory of another faculty member.

The public subdirectory has been configured to be RX (read and execute) accessible by all domain users. This is the directory where faculty place files to be available to students and others. Since each faculty has full control over their home directory, they are permitted to change any of the default settings. The permission can be changed from within Windows Explorer. Some faculty have created a special subdirectory in which they place files that can be changed and manipulated by students and others.

Faculty members have full control over their Web directory in the *webnotes* share. They can add, delete, or change any file or subdirectory in their individual parent directory. Since those directories are intended to be Web accessible files, permissions on these directories have been set so that any faculty can view any other faculty files.

All faculty workstations have been set up with persistent drive mappings to the *user* and *webnotes* shares. They are designated as drive M and W respectively.

The server is also running the ftp service; consequently faculty are able to maintain their web materials from any location that supports Internet ftp access. Since the main purpose of the ftp service is to support faculty maintenance of their personal directories and files in the Web content directories, the ftp service has been configured not to support anonymous logons; only basic Windows NT Challenge/Response method.

Laboratory Workstation Configuration

There are two types of accounts in a Windows NT network -- a computer account and a user account. All Windows NT workstations or servers that participate in a specific NT domain, must have a computer account. If the Windows NT workstation is not a member of the domain (has a computer account), then no user logged on to the workstation can access domain resources. Admittedly, this was a little confusing at first. But once the concept is understood, it becomes "clear" and "obvious." In any event, we have created a systematic sequence of computer names and corresponding user names for the computers in the mathematics laboratory. As a matter of policy in the mathematics domain, all computer names (which become NT Computer Account Names) end with the letters "cmpt". For example the workstations in the mathematics laboratory are named Maxxcmpt, where xx is an integer represent the number of the station.

The laboratory workstations have been configured to use NTFS file system. The only local accounts that reside on the individual workstations are the default accounts that are created when the Windows NT Workstation is installed. All users at those workstations log on as a specific domain user. The logon process and scheme will be explained below.

There is only one disk partition on the workstations. The NTFS security settings have been changed for RX access to the entire disk partition (except as described below) for all domain users. Thus, a typical domain user cannot add, delete or any way modify any file or application on the local drive. With this protection, it is feasible to have all applications locally installed. The local installation of software reduces network traffic. This reduced network traffic is particularly noticeable in a shared 10Meg local network segment.

As mentioned, several of the directories and files need permissions higher than RX. In our environment, those directories are:

C:\temp
C:\winnt\cookies; ..\help, ..\history; ..\Temporary Internet Files; ..\System32\Spool

In order to keep those directories clean, a logon script has been created that cleans out those directories (except for c:\winnt\system32\spool and ..\help) at each logon.

Other than in those directories, users do not have any privileges except read and execute.

In addition to the NTFS security, control over the workstation environment is maintained by Windows NT Policies. The basic policies that have been invoked come from the standard issue policy templates: common.adm and winnt.adm. A good reference for a description of these templates in found in the Administrator's Guide to the *Zero Administration Kit* (for Windows NT server 4.0 -- available from the Microsoft site.). Some special policies have been added to the standard templates.

Appendix A contains a list of the policies that have been implemented for the laboratory workstations.

The supplemental policies that have been developed are contained in a template called "miscellaneous.adm." At the present time, the four policies are:

Drive M -- which creates a persistent network drive mapping to the User share directory on the server.

Start Banner and Arrow -- disables the flying start arrow and banner at cold startup.

Default Beep -- disables the annoying beep that occurs when a user attempts to perform an operation without completing the task of the active window. That beep becomes annoying when there is a room full of students.

Screen Saver -- controls the standard features of the screen saver.

A copy of the template is found in Appendix B.

A domain user account has been created for each computer in the laboratory. These user accounts are of the form "maxx" where xx is a number from 1 to 25. The registry is set on each workstation so that it automatically logs on to the corresponding domain account. For example, the computer with the name "ma12cmpt" automatically logs on to the domain account "ma12." We have avoided any potential network Security ID (SID) problem by not having local user accounts on the workstations. Since all users will be logged on using distinct domain accounts, there cannot be any duplicate SIDs logged onto the network at any given time.

The NT Resource Kit tool, autologon.exe, has been very helpful in setting up the autologon feature. It is placed in a password protected, virtual directory on the server that can be accessed from any web browser. The problem is that the tool will only set the autologon to the currently logged on user. By password protecting the directory and having it accessible from the web, we can log on as the user to which the autologon feature is to be set then invoke the password protected autologon from the web browser.

Special Tools

The Mathematics Department application requires administering approximately 50 user accounts, 3 global groups, and 40 computer accounts. The standard administrative tools that are installed with the NT server software are adequate to administer that relatively small number of accounts.

However, some additional third party products have been acquired, as well as a couple of tools from the NT Server Resource Kit. These include:

> Registry Edition Extension, regeditx.exe -- an extension to the standard register editors regedit.exe and regedt32.exe. This is a product by DC Software Design.
>
> UserManagementNT Lite, um.exe -- a free product from Simac Software Products http://www.tools4nt.com. This product presents a single screen for entering user account setup parameters. The commercial version has many more features.
>
> DiskeeperLite -- a free product from Executive Software International, http://www.execsoft.com/. This is a disk defragmentor. The "Lite" version supports some of the basic features of the full commercial version.
>
> Hyena -- a commercial product that presents an enhanced tool to administer user and computer accounts under a single user interface http://www.adkins-resource.com/.
>
> QuickBack -- a shareware product that has a nice clean interface that sets up backup profiles -- http://www.centered.com. It is used on faculty workstations to ease the pain of backing up their local files to the server.
>
> Regclean.exe -- a Microsoft product that reconciles and cleans out unneeded entries in the registry.
>
> Autologon.exe -- an NT Server Resource Kit tool that sets the registry settings for a Windows NT autologon sequence. This tool has been helpful in tuning the individual workstation setups in the laboratory.

Resources Required for On-going Administration

At the present time, there is almost no on-going administration required. The server backup is administered automatically by the University backup process. Occasionally a new user account is created (an adjust faculty member desiring to provide on-line materials for students. Occasionally a faculty member will need assistance in setting up special permissions on files or directories. Once in a while the event log is reviewed to see if there are any suspicious activities. All in all, it just keeps on humming without administrator involvement.

Successes

This has been a genuine success. In a year and a half, the server has been out of service two times; neither of which was the fault of the server setup or operation. The first time, the server was unreachable for an entire weekend. It turned out that the network administrator changed some DNS settings early one Saturday morning. The IP address for the server was reassigned while no one was told about the change. The second time was also the result of an IP address change. In an effort to standardize printing server names, the IS department changed all print server names and IP addresses. The corresponding changes were made on all Novell servers. However, no one remembered that the Mathematics Laboratory was using direct TCP/IP printing to the lantronics box. Again, the laboratory was out of service until we figured out what had been done.

During the almost two years of operation, the server has never failed or halted requiring a reboot. The only preventative administrative maintenance that is being done is a reboot and a disk defrag every couple of months. There is no regular schedule since it doesn't appear to make any difference.

It is clear that the current environment supports the goal of having a computer laboratory that can be open to the public (we are talking about any Monmouth University student) when it is not in use for a scheduled computer laboratory class session. About 50% of the time, the open times for the laboratory are not supervised by a laboratory assistant. When a class moves into the laboratory, the students in the lab just get up and leave. Sometimes they close out their applications and sometimes they do not. In any event, the workstation environment is intact and the class begins the laboratory session without any intervention. It does work!

Current Problems

There are only two remaining issues. Monmouth University students have been provided with a "home" directory on the UNIX computer that functions as the student mail server. They maintain their own directory with read/write privileges. At the present time, students cannot access their home directories in the Mathematics laboratory.

The second problem is performing a "cold" network-boot to the Mathematics NT Server. We have not worked out all the details to make that happen. As a result, the laboratory system image template is being kept on a Novell server.

Future

Other than resolving the two issues mentioned above, there are no plans to significantly change the environment. The Mathematics Laboratory is scheduled to receive a new set of computers -- the traditional laboratory upgrade. This will require creating a new image since there will be a new hardware configuration. Once the new image is created, it will take about a day to set up the new computers in the laboratory -- that is, if we don't forget how to re-image a computer, since we have only re-imaged two computers since July 1998.

Selected Resources:

Below is a list of resources that I have found useful in a "do it yourself" effort to install and operate a relatively small (around 50 workstations and user accounts) NT server networking environment.

> Attend a one-day workshop on installing and setting up an NT Server (make sure it's a "hands-on" workshop).
>
> Obtain a copy of one of the soft cover NT 4.0 server books that are on the market. (I used *Inside Windows NT Server 4* by Drew Heywood, published by New Riders.)
>
> Windows NT Server Resource Kit (three books and a couple of CDs) published by Microsoft Press
>
> *1001 Secrets for Windows NT Registry* by Tim Daniels, published by Duke Press
>
> *MS Windows NT Workstation Deployment Guide--Automating Windows NT Setup*, a Microsoft TechNet document available at http://www.microsoft.com/technet/cdonline/gdautset.htm
>
> Spend some time becoming familiar with the Windows NT Server site at www.microsoft.com
>
> Subscribe to the *Windows NT Magazine*
>
> Obtain a copy of the Administrative Documentation for the Windows NT Zero Administration Kit.
>
> Join some of the NT newsletters, e.g., Windows Platform News at newswire.microsoft.com and SANS Institute at sans.org

Conclusion and Recommendations

Go for it!

Appendix A
User Policies -- Laboratory Computers

This appendix contains a listing of the policies that have been implement for the Mathlab user group. The policies are administered through the Policy Editor on the server.

Control Panel

- Display -- all options are checked restricted

DeskTop

- Wall paper -- a wall paper file is maintained on the server. The file contains the University Logo with a Mathematics Computer Laboratory subtitle

Shell

- Restrictions
  - Remove Run from Start Menu
  - Remove Folders from settings on Start Menu
  - Remove Taskbar from settings on Start Menu
  - Remove Find Command from Start
  - No Workgroups contents in Network Neighborhood
  - Don't Save settings at exit

System

- Restrictions
  - Disable Registry editing tools
  - Run only allowed Windows applications (this policy contains a list of about 20 applications that are available to be run from the workstations in the laboratory)

Windows NT Shell

- Custom Folders
  - Custom Desktop icons (name of the local directory containing the desktop icons)
- Hide Start Menu subfolders
- Restrictions
  - Remove Common Program Groups from Start Menu

Windows NT System

- (nothing checked under this category)

Miscellaneous (Locally developed policies)

Appendix B
Miscellaneous Policies Temple

```
CLASS USERCATEGORY "Miscellaneous"   Category "Drive M: (Mathematics Drive)"
 Policy "Enable Persistent Drive Mapping (Reconnect at Login)"
        KeyName "Network\M"
          ACTIONLISTON
               VALUENAME  ConnectionType  VALUE  NUMERIC 1
               VALUENAME  ProviderName    VALUE "Microsoft Windows Network"
               VALUENAME ProviderType     VALUE  NUMERIC 131072
               VALUENAME UserName           VALUE ""
          END ACTIONLISTON
          ACTIONLISTOFF
               VALUENAME  ProviderName    VALUE DELETE
               VALUENAME ProviderType     VALUE DELETE
               VALUENAME RemotePath        VALUE DELETE
               VALUENAME UserName           VALUE DELETE
          END ACTIONLISTOFF
         Part "Drive M:" EditText
               VALUENAME  RemotePath
         End Part
         Part "Enter the UNC path.  This supports Microsoft Windows
            Networks."    TEXT
         End Part
     End Policy
   End Category


  Category "Start Banner and Arrow"
     Policy "Disable the Startup Banner and Arrow"
     KeyName "Software\Microsoft\Windows\CurrentVersion\Policies\Explorer"
       VALUENAME NoStartBanner
             VALUEON NUMERIC 1  VALUEOFF NUMERIC 0
    End Policy
   End Category

 Category "Default Beep - Sounds"
     Policy "Disable the Default Beep Sound."
     KeyName "Control Panel\Sound"
       ACTIONLISTON
         VALUENAME Beep VALUE "no"
         VALUENAME ExtendedSounds VALUE  "no"
       END ACTIONLISTON
       ACTIONLISTOFF
          VALUENAME Beep VALUE "yes"
         VALUENAME ExtendedSounds VALUE "yes"
       END ACTIONLISTOFF
    End Policy
   End Category

Category "Screen Saver Activation"
     Policy "Set Screen Parameters"
     KeyName "Control Panel\Desktop"
       ACTIONLISTON
         VALUENAME ScreenSaveActive VALUE "1"
         VALUENAME SCRNSAVE.EXE VALUE "c:\WINNT\System32\sstext3d.scr"
       END ACTIONLISTON
       ACTIONLISTOFF
         VALUENAME ScreenSaveActive VALUE "0"
         VALUENAME ScreenSaveTimeOut VALUE  "0"
         VALUENAME SCRNSAVE.EXE VALUE ""
       END ACTIONLISTOFF
        Part "Time in seconds" EditText
```

```
         VALUENAME ScreenSaveTimeOut
        End Part
        Part "Enter time (in seconds) to Screen Saver."  TEXT
        End Part
      End Policy
      Policy "Screen Saver Text"
      KeyName "Control Panel\Screen Saver.3DText"
         Part "Screen Text" EditText
               VALUENAME  Text
         End Part
         Part "Enter the Screen Display text."   TEXT
         End Part
      End Policy
   End Category

END CATEGORY
```

Students, Technology and a Liberal Arts Education

Nancy Magnuson
College Librarian
410 337-6364
nmagnuso@goucher.edu
Jill Zimmerman
Associate Professor of Mathematics and Computer Science
410 337-6227
jzimmerm@goucher.edu
Goucher College
1021 Dulaney Valley Road
Baltimore MD 21204

Abstract

"The creative application of information technology to a liberal arts education." What does this institutional priority statement mean for the real life of students, faculty and staff? We examine the process at Goucher College in which existing campus relationships were strengthened and new alliances formed in order to insure that students gain appropriate IT skills.

Since change has become a constant, establishing a process for change with strong lines of communication across political boundaries is critical. This process at Goucher College includes a new Information Technology Advisory Group, representing all campus segments and an increased technology role for the library. Our hope is that we have established relationships that will enable appropriate instruction to be available for each new cohort of students, allowing them to become comfortable and adventurous users of technology.

Text

Goucher College has identified "the creative application of information technology to a liberal arts education" as one of its institutional priorities. The actual implementation of that priority has played itself out in many ways.

Between 1994 and 1996, the College conducted a comprehensive institutional planning process. Representatives from all sectors of the campus community met to examine external variables – demographic change, current and projected economic climate, sociocultural trends and technological change – as well as Goucher's particular strengths, traditions, values and aspirations. From that examination they began to shape a vision for the institution and, within that vision, six core priorities.

The first priority is one that has guided the college since its founding, "Sustained excellence in liberal arts education." Priority two on the list reads: "the development of a strong information technology infrastructure, and the creative application of advanced technology to a liberal arts education."

When those words were written in January of 1996, the campus network infrastructure was somewhat underdeveloped. Very few offices had Internet access, three email systems (Pine, WordPerfect Office, Netscape) were in use, much of the network was running on copper wire. Our administrative system was faltering and we had no voicemail. We also had a very wide range of technological savvy among the faculty, staff and students.

The coupling of this shift in institutional priority with the large amount of needed change created a very dynamic environment!

In the summer of 1996 we wired all the residence halls and faculty offices, replacing copper with fiber where possible, moved to a T1 line for Internet access and implemented MS Exchange as the common email system for all students, faculty, and staff. The college's Board of Trustees formed a new Task Force on Technology.

In the summer of 1997, we completely reorganized the management of computing support, from a traditional academic and administrative split. The college librarian took over the teaching and learning support functions from the old academic computing department. All other hardware, software and networking support became part of the new department of Computing Systems and Network Services. There were new persons in key positions and lots of other staff turnover. This reorganization of campus computing services increased the role and visibility of the library. The position of Decker Chair for Instructional Technology, reporting to the College Librarian, was created. The library began to add many more Web-based resources and was able to upgrade a support staff position to create an additional professional position with major instructional responsibility, another library position was redefined to incorporate Web development work. A new technology advisory group was formed, with representation from all campus segments.

There were changes in the curriculum as well. Goucher was one of the early colleges to implement a computer proficiency requirement. Prior to September 1997, all students at Goucher College were required to exhibit "Computer Proficiency" by either taking a sequence of two half semester computer science courses or by taking an exemption examination. Institutional pressures to reduce the number of course requirements resulted in the elimination of the computer science courses by recommendation of the curriculum committee and vote of the faculty. A task force was then appointed to rethink the requirement -- the authors were both part of that group.

The new requirement developed by the task force calls for all of the major disciplines to incorporate computer proficiency within the majors. This would promote the use of application specific uses of technology within the disciplines. A set of criteria for these departmental proficiencies was established by the task force and endorsed by the faculty. Those criteria call for students to be able to: access and evaluate information appropriate to a discipline acquired through the Internet or other electronic databases; understand the algorithmic thought process and problem solving as related to the computer; understand the societal and ethical implications of computer technology as related to a discipline.

Some departments use as their requirement Computer Science 102, Computing and Society, a newly developed course that some of you have heard about in a previous session at this conference. Others have developed their own new courses such as "Computer Proficiency for Musicians," or enhanced an existing course such as History 288 "History of Cross-Cultural Trade in Asia" in which students develop multimedia projects using a variety of computer tools as well as both quantitative and qualitative data.

> *Example, from college catalog. Computer Proficiency for Musicians. Designed for music students with little or no prior computer experience. We will look at what computers are, how they work, what they can do for us as musicians, and how they affect many other aspects of our life as well. Focus is on the humanistic rather than the technical side of computing, but enough technical information will be included to make practical use of computers. Required for all music majors.*

The major concern arising from this change to computer proficiency within the majors was that students ordinarily do not declare a major until the spring semester of their sophomore year. It is critical that students learn about the effective use of technology and information as early as possible in their college careers and it was feared that many students would fall through the cracks unless some plan was devised.

When both the Trustee Task Force on Technology and the Information Technology Advisory Group identified student technology literacy as a concern, the authors were again members of both groups and seized the opportunity to take this on as a initiative that would be solidly based in the academic program, and would move beyond the mechanics of computing.

During the spring semester, 1998, informal conversations were begun, as well as investigation into how other campuses had addressed this concern. In June a cross-section of Goucher faculty and staff who are involved with technology services and first year students met with Susan Campbell and Kimberley Donnelly of York College for a presentation of their 2-credit class "Info Lit 101." In addition to describing their course, they discussed the alternative of a "course-integrated" approach of including technology components in a number of places in the curriculum. This presentation energized people's thinking, even though most who attended felt that York's strategy was not the right one for Goucher to use at this time. The participants recommended rather that Goucher use the course-integrated approach of incorporating technology basics into existing courses and services, allowing each of us to build on knowledge students have previously acquired.

Working together, with cooperation from many parts of the campus, we created a plan that articulates how a Goucher student becomes a comfortable, yet adventurous user of technology. Departments can be assured that all students entering their major will have a basic set of computer skills which departments can build upon for computer literacy within the major. The plan strongly endorses York's philosophy of emphasizing the learning of concepts rather than specific tools to better prepare students for an ever-changing environment.

We presented the plan to a number of campus groups who reacted positively. It was endorsed by the curriculum committee, the department chairs, the faculty, the Information Technology Advisory Group and the technology task force of the Board of Trustees.

Components of the Plan:

There are five main components in which portions of information technology skills are implemented: the orientation and check-in period at the start of the year; the freshmen course "Transitions" which is taught by staff members and is designed to give freshmen the necessary knowledge, skills and tools to succeed during their transition from high school to college; "Frontiers" which is a freshmen seminar course taught by faculty across the disciplines; the English composition courses; and support services provided by "Student Technology Assistants."

In the orientation and check-in period prior to the start of the academic year, all new students receive their email accounts. The Residential Computing staff conducts half-hours workshop sessions covering email, voice mail, and computer lab procedures. In addition, the computing staff holds a "Connection Fair" which provides a drop-in location where email and networking software are installed and configured on student computers. The expected outcome is that students will have their personal computers networked and be familiar with email and voice mail communication prior to the start of classes.

We added two new units to Transitions, which is required of all freshmen. These units cover an introduction to the World Wide Web and ethical issues related to information technology. Librarians Margie Simon and Tanya Shkolnikov developed a 50 minute class on the World Wide Web based on a needs-assessment survey distributed to students enrolled in Transitions and taught this class to each course section. The areas covered in the hands-on session include URL structure, search directories, meta-search engines and more effective ways of using search engines. The expected outcome is that by the end of the first semester, all students will be able to find information resources on the World Wide Web.

Computer science professors, Jill Zimmerman and Tom Kelliher provided a class module to Transitions instructors covering societal and ethical computing issues. These topics included e-mail and voice-mail etiquette, intellectual property rights and software piracy, and privacy and security issues. The module material included case studies to help generate discussion on these issues. The expected outcome is that students will better understand their ethical responsibilities as part of an academic community.

> *Example: Privacy and Security Issues*
>
> *Case study: In 1992 two students at a university were accused of violating the university Honor Code by colluding on a homework assignment. The homework was completed on the university computer system and turned in via email. The instructor noticed that portions of the work were identical. The computer system administrator was asked to examine system backup tapes for that time period and which produced evidence that "Student B" had emailed the homework to "Student A" right before Student A turned it in. The students claimed that an unknown "User X" had gained access to the accounts. The Honor Council did not accept this explanation and convicted the two students. Student B was later cleared by further evidence from the system administrator suggesting that Student A committed the cheating alone by logging in to Student B's account*
>
> *Issues:*
> *Computer account security can be breached by failure to log off (thus giving anyone*

who notices, access to email and files as well as your email identity) as well as hacking.

E-mail accounts can also be spoofed, where someone sends an e-mail and it looks like it came from someone else.

A big privacy issue is that email is not as private as we think. Computer system administrators have access to everyone's email and your email does not get deleted from the system just because you hit the delete key. The email is archived on the system and can still be retrieved. (Law enforcement can subpoena these archives.)

The Goucher Guidelines for Use of Computer Resources states "Users are hereby notified that there are no facilities provided by Goucher for sending or receiving confidential messages over e-mail or the internet. The system administrator and his or her designees have access to all messages and files of any user. Goucher reserves the right to monitor e-mail and to access and disclose the contents of e-mail messages."

Discussion:
Should the college administration have access to your e-mail or files stored on the network computers if they believe that you have committed a crime or honor code violation?
How can we protect the security and privacy of our electronic data?

Resources:
Articles on case study (www.nd.edu/~rbarger/cp-cheat.cse)
E-mail privacy FAQ (www.well.com/user/abacard/email.html)
An analysis of e-mail privacy issues
(educom.edu/web/pubs/review/reviewArticles/29259.html)

Leslie Harris, the Decker Chair of Instructional Technology, works with the Frontiers faculty (as well as faculty of other freshman level classes) on ways to incorporate activities that reinforce the role of technology in the curriculum. Barbara Simons, library liaison to Frontiers, provides library support that includes assistance in locating appropriate web sites. The expected outcome is that the important role of technology in the curriculum will be reinforced.

Librarians Margie Simon and Tanya Shkolnikov meet with the English composition classes twice during the Fall semester and at least once during the Spring semester. These sessions provide students with an overview of print and electronic information resources, techniques for developing effective search strategies and guidelines for evaluating sources. The expected outcome is that students will be able to select appropriate, high-quality sources that meet their information needs.

Lastly, the Student Technology Assistant Program provides assistance to students as they encounter problems using the hardware and software in Goucher's computer labs. STA's responsibilities include: staffing and monitoring the labs, providing assistance to students as they encounter problems using the hardware and software in the labs, and advancing their knowledge of the computer resources available to students, in particular by completing the training process required of all STAs. This training includes learning to work with Windows 95/NT, Exchange Mail, Microsoft Word, PowerPoint, and Excel, along with learning to write HTML code. Those STAs who have completed at least Level I of the training process have the opportunity to sign up for additional hours as part of several STA "teams," such as training and documentation, Web designers, digital media specialists and faculty technology consultants.

Evaluation of the first year's implementation

:

As with all plans, the implementation was mixed and will have to be continually reevaluated and modified.

In orientation, the short e-mail demonstrations had mixed reviews. There was a good turn-out of students but there was too much information packed into the 30 minutes sessions and they need to be expanded in length. The students recognized the importance of these sessions and rated them the "best informational session" in an evaluation of the orientation session. In contrast, a significant number of respondents also rated the sessions as not helpful. The Connection Fair staffing couldn't keep up with the demand and many students had to wait a couple of days to have all their networking software installed.

The skills assessment survey for the Transitions classes indicated that students both wanted and needed to learn how to perform web searches more effectively and how to evaluate information sources.

> *TO: Students enrolled in Transitions*
> *FR: Tanya Shkolnikov and Margie Simon, Readers' Services Librarians*
> *RE: Searching the Internet*
>
> *We will be meeting with each section of Transitions during the month of November to help you search the Internet more effectively. In order to make this class as useful as possible we would like to find out what you already know about searching the Internet and what you would like to learn.*
>
> *Please answer the questions below and return to your Transitions instructor.*
> *I search the Internet (check the appropriate response):*
> *never___ less than once a week___ at least once a week___ every day___*
> *List your favorite search engine(s):*
>
> *When I search the Internet I find the information I need:*
> *never___ sometimes___ often____ always____*
> *I would like to learn the following about searching the Internet:*
>
> *Name*____
>
> *Name of Transitions Instructor*______________________________________

Again, feedback on this session was mixed. According to one faculty member, students "hated it, but they hated everything about Transitions. The students with more experience with the Internet said they were bored... some of the other less-experienced students did hesitantly admit that they found it useful." There was some variation, often according to the degree of participation of the instructor. Librarians received thank-you notes from one class with comments like "I really learned to narrow down my searches before using a search engine so as to find more accurate information" or "Before your presentation I was clueless as to how to find information on the Internet. I will definitely be using the skills you helped me develop."

Although slightly more than 10% of students rated themselves as beginners in the survey, the special workshops for beginners were not utilized. The librarians at the reference desk observed that students started their searches "without fear" and even when they do not have all the necessary skills, they at least know what to expect from their interaction with different data bases. The librarians were also working under the assumption that students would only be asked to do limited research during the Fall semester. While this has been true in the past, it was not necessarily true for all freshmen this past year. The timing of both the Transition sessions, and the English composition sessions needs to be better, so as to be more effective in teaching the first year students the right skills and concepts at the right time.

We received very little feedback concerning the Transitions computer ethics module and we need to work closer with the Transitions faculty in the future. A large percentage of the Frontiers sections incorporated technology into their classes even though this was not stated as a requirement until next year. A number of the sections made use of web boards and class communication via email.

The Student Technology Assistants have been trained and are being utilized in the labs. One student was specifically trained as a "Computer Tutor" who could be scheduled to tutor students on particular software packages. Her services have not been in demand, however, since students want to ask assistance directly at the time when they encounter a problem. More needs to be done to provide students with a range of options for getting information and a FAQ manual is being developed.

What's next?

The entire Transitions experience is being revised. Since neither librarians or students were satisfied with the Web searching component, it is highly unlikely that we will do that piece again.

Fortunately, Frontiers is also being revised and one of the new components is a directed research paper. The library staff is prepared to work closely with each section to develop this project. We expect that teaching better use of the Web will be more fruitful in the context of this course assignment. Another goal of the new Frontiers is to include work that introduces students to the use of educational technology. Support and training is available for Frontiers faculty who are new to the uses of educational technology.

We have a stronger cadre of STAs and will try again to develop student-run workshops. Although STAs began the year feeling that attendance would not justify holding workshops, some felt by the end of the year that perhaps it wouldn't be a bad idea.

The library received a grant from the Arthur Vining Davis Foundation to create the position of information technology librarian, and to improve some other technology within the library. We will be implementing provisions of that project, including a laptop lending program. We will also be increasing access to Web-based materials and will need to adjust some training strategies.

We began this project understanding that the situation would change each year with the students, the technology, and the academic program. We feel that we improved the lines of communication among the many segments of our campus community who contribute to the information and computer literacy of our students so that we can better deal with that change. We also feel that we are much better positioned to address the challenges of the next generation of first-year students.

Web Management of Student Information

Robert Moldoff
Applied Business Technologies, Inc.
4631 West Chester Pike
Newton Square PA. 19073
(610) 359-0700
moldoff@abtcampus,com

Abstract

Using Microsoft's new Visual InterDev Development tool, ABT has developed two new Web products that extend student and faculty access to administrative information. IQ.Student lets students take a more proactive role in their own affairs, allowing them to view their account balances, grades, courses, and unofficial transcripts and to register for classes. It also lets prospects view course catalogs and access other online applications. IQ.Faculty allows faculty to enter grades, access student histories and profile sheets, and update student records. Both products run on either PCs or ACs, requiring only Internet browser software such as Netscape Navigator or Microsoft's Internet Explorer. The session will include a product demonstration.

(Robert's paper was not available at the time the Proceedings went to press. He will supply copies of his paper at his talk or provide a url if it is posted on the web.)

Technology in the Classroom: Enhancing What Already Works

Jon Mueller
Professor of Psychology / Technology Implementation Coordinator
North Central College
Naperville, IL 60566
(630)-637-5329
jfm@noctrl.edu

Perhaps technology will transform teaching at some time, and perhaps it has for some teachers. But many, if not most, faculty are relatively content with their methods of instruction. So, when faculty are told that they "need" to integrate or infuse technology into their teaching, they often interpret such a plea as an intimation that they need to rethink what they do in the classroom. As a result, faculty are sometimes resentful or suspicious of what technology has to offer.

At North Central College, we have tried to expose faculty to a wide variety of instructional uses of technology without claiming superiority for one approach or another. Additionally, we have tried to introduce faculty to the idea that technology can be used as another tool to enhance what they already do well. One example of such an effort by our Faculty Technology Group is a series of workshops it offered during our three-week Interim period at the end of the fall term.

Before we conducted training workshops on PowerPoint or course web page development towards the end of the week, we first ran a series of concurrent presentations on the use of technology within common pedagogical approaches. Specifically, we presented sessions on Technology in the Lecture-oriented Classroom, Technology in the Discussion-oriented Classroom, and Technology in the Project/Problem-oriented Classroom. The concurrent sessions were repeated so that faculty could choose to attend two of the three sessions.

The concurrent sessions were introduced with an overview of current instructional technology available on our campus and an overview of the many possible uses of a course web page. Course web pages are no longer just a repository for course materials such as syllabi and assignments. Web pages can now be vehicles through which a wide variety of other technologies can be made available to students and used to advance the course goals. Whether teachers primarily lecture, engage students in discussion or problem-solving, or use some other approach, course web pages can serve faculty goals. So, we wanted to make sure faculty are aware of the possibilities of course web pages before we address specific uses of technology.

As mentioned above, the concurrent sessions focused on three of the more common instructional methods that faculty employ and find successful. Despite a movement towards more active and student-centered learning, lecture is still the predominant form of instruction on most campuses including ours. So, instead of asking faculty to abandon something that works for them, we wanted to illustrate how technology might enhance it. For each of the modes of instruction, I will list below some of the types of technology that were presented during these sessions. (Note: During my presentation I will visit a few of these examples to illustrate some of what was presented at the sessions. The lists below are not meant to be exhaustive. Rather, they are meant to give a sense of the variety of tools available, accessible to even the least technologically proficient faculty member.)

TECHNOLOGY IN THE LECTURE-ORIENTED CLASSROOM

PART I: Using Technology to Introduce *"New"* Material

Technology increases the number of ways I can now introduce new information, ideas or examples into my classroom. Some means of introducing new material might include:

1. Through course web pages (or just through a browser) --
   - links to web pages I created that I want to display and talk about in class
   - links to images/animations on the web
   - links to useful sources of text on the Internet
   - links to streaming audio/video
2. Text and multimedia from CD-ROMs
3. Documents cameras that allow me to display
   - three-dimensional objects
   - images/text from books
   - student work
4. Archives of discussion groups on the Internet
5. Discipline-specific software that introduces new info/images (e.g., a biology lab program, Maple or some other math program)
6. Video or laser disk
7. Others

PART II: Using Technology to Enhance *"Old"* Material

Not only can technology introduce new sources of information into the classroom as described above, it can also enhance the presentation of information already contained in a lecture. Some examples of how to enhance the "old" material might include:

1. PowerPoint slides, of course (and I can add narration if I wish)
2. Putting the info/images into web pages to be displayed
3. Combining video with text presentation (e.g., displaying questions to consider while viewing the video)

4. "Burning" your own CD to digitize large amounts of text/images/audio/video to bring into the classroom

5. Overheads! (you can turn PowerPoint slides into overheads if you don't have a data projector in the classroom)

6. Generic or "tool" software that is often available campus-wide such as Excel or Access or Word that allows me to illustrate how to solve accounting problems or conduct some statistical analysis or just introduce text as part of my lecture that I might have used the blackboard for before

7. Others

PART III: Using Technology "*Outside*" the Classroom to Enhance the Lecture

To reinforce and supplement my lecture, I can provide students with access to additional material outside the classroom as well as opportunities to review and reflect upon the content of the course. Some ways technology can assist this process might include:

1. through a course web page

   - provide links to supplemental material
   - provide links to problem sets for review/practice
   - provide links to the very materials I used in class to introduce material
   - (e.g., PowerPoint slides, image databases, spreadsheets)

2. Using a product such as Real Presenter, I can create PowerPoint slides that are coordinated with my narration of the slides and turn all of that into a web page with streaming audio that can be viewed and listened to through a product like RealPlayer. This way, I can have students listen to and see my lecture **before** they come to class, which allows me to use class for extending the lecture, engaging in discussion about it, employing activities to illustrate points of the lecture, etc. Student access to sound-enabled computers is a requirement.

   Or, students can view these PowerPoint slides **after** my lecture anytime they want as a way to review the material.

3. Use an excellent freeware program such as Hot Potatoes to create web-based, interactive quizzes of different types that allow students to review material

4. Others

TECHNOLOGY IN THE DISCUSSION-ORIENTED CLASSROOM

PART I: Using Technology to Promote/Enhance Discussion "*Inside*" the Classroom

Some examples of how technology can be used to promote discussion inside a classroom or lab, might include:

1. A Networked Writing Environment or similar lab setting where students and faculty share and discuss works in progress
2. Display web sites that contain text/images/video/sound that could serve as source for discussion (as we have with paper resources)
3. Use a document camera to display student products generated before or during class for the purpose of discussion -- e.g., if I had students work in groups to generate a list or solution or diagram, I wouldn't have to have them come up and recreate it on the board, I could just display on the screen very quickly
4. Have students join an ongoing discussion in a relevant MOO/MUD
5. Use NetMeeting to carry on a discussion with people in another location
6. Use other distance learning tools for this purpose
7. Others

PART II: Using Technology to Promote/Enhance Discussion "*Outside*" the Classroom

Some examples of how technology can be used to promote discussion outside a classroom or lab might include:

1. E-mail -- there are many different ways e-mail can be used to promote discussion and many different types of e-mail assignments
2. Threaded-discussion or conferencing software (e.g., WebBoard or Discus) -- again, there are many different ways this tool can be used in a course and linked through a course web page, and, out-of-class postings can also be brought up in class for further discussion
3. Discussion groups (e.g., listservs) on the Internet
4. MOO's/MUD's -- Michael O'Conner has a nice web page listing many of the best such virtual environments such as Mundo Hispano for Spanish courses or BioMoo that lend themselves to some very rich discussion/learning experiences
5. Chat rooms -- be used as virtual office hours also

6. Microsoft's NetMeeting can be a tool for holding document-sharing/discussion sessions outside of class and even between students at different institutions

7. Others

TECHNOLOGY IN THE PROJECT/PROBLEM-ORIENTED CLASSROOM

Frame the Problem

Inspiration
Present Samples
Who Killed William Robinson?
Salem Witch Trial

Gather Info (can get training for your students on searching web/electronic sources)

Library Online
Web resources - HTB 506
Web resources - SCI 210
Greenhouse Gas Emissions - Graphics
Roper Center -- survey data
Impeachment of Andrew Johnson
Yahoo
AltaVista
Search Strategies

Share/Discuss Info

Students create links (can get training for your students to create web pages)
NetMeeting
Discussion Session

Analyze Data/Info

Evaluate info
Networked programs -- SPSS, Excel, Access, etc. -- can bring up in classrooms
Put problem sets online for students to download
Quizzes/homework online

Create Products/Solutions

Suite of Office Programs
MOO's

Present Products/Solutions

PowerPoint slide show
Multimedia
Student Web Projects
Family Farm Project
More Projects

EXTENDING THE MODEL

Since its presentation in the fall, this model of technology enhancing lecture, discussion and problem-solving has been repackaged and presented a few other times. On campus, I have condensed the three sessions into one to present to smaller groups of faculty on occasion. Similarly, I presented a condensed version to the faculty at another local college as they were just beginning to investigate how technology could be a tool for teaching. Most recently, the technology steering committee of the Associated Colleges of Illinois of which I am a member has decided to expand the model and present it as one of a group of workshops it will offer faculty around the state this summer. At these summer workshops, faculty will be able to try out some of the software and hardware illustrated in the presentations, and they will engage in some further discussion about its use.

CONCLUSION

In colleges like ours, I am finding that faculty are becoming more receptive to introducing technology into their instruction. But a few misconceptions about integrating technology continue to inhibit some from exploring it. For example, faculty often overestimate the time it will take to learn some of the technologies. Additionally, many faculty believe technology is not particularly relevant to their disciplines because they are unaware of the variety of tools and uses of those tools that exist. Finally, some faculty are reluctant to pursue technology because they think it will require them to let go of what already seems to be working. Through workshops and presentations of the type described above, we can reassure faculty that technology can work for them.

No, We're Not Technologically Ready for the 21st Century

Retha Murphy
University of Alabama Libraries
University of Alabama
Box 870266
Tuscaloosa, AL 35487
(205)348-9016
rmurphy@bama.ua.edu

During the past few decades we have experienced a quantum leap in the growth of information and learning, particularly in higher education environments. This leap of growth has dramatically changed the way we acquire, store, and provide access to information during the past century. In looking back to see how we got to this information revolution and where we go from here, we must first determine if we are actually assisting students in their quest for knowledge or if we are cheating them from the research experience. Are we as faculty members, information service providers, and information systems personnel teaching students to depend on the computer totally for their informational needs? Are we teaching students to search for information for which there maybe no organizational standard, information which may be inaccurate or non scholarly, and information which may or may not be available in the future? Providing immediate access to information electronically, particularly through full-text databases and the Internet does not necessarily help students think through the research process, organize their thoughts, and critically evaluate sources. In evaluating our progress thus far, we have to examine the entire instructional process. How could the research project be more beneficial to students? Are we teaching students to press the right button at the right time, rather than teaching them to choose the best source for a particular project? As we approach the 21st Century, we must ascertain if we are helping our students or if we are cheating them in the process of research. We must resolve to be prepared for the next century by re-examining the way students learn, determining how computers effect academic achievement, and honestly accessing whether our students are receiving the full benefit from a particular assignment.

There are many students today that have under-developed research skills. Students, in general, have become very accustomed to having information in any form at their beckoning call, with a few strokes on a keyboard. Hence, some students are missing many of the benefits inherent in a research project. There is so much information that is so readily available, that it is difficult for many students to refuse this information because it is too brief or too general for their assignment. Many databases available in libraries today are specifically designed for a certain audience. Some databases are designed for graduate level study, while others are designed for undergraduates, and still others are more appropriate for K-12 students. Students should be encouraged to choose the most appropriate source of information for any research project or paper, whether this information is in print or electronic format. Simply finding a few relevant subject citations through a keyword search in a database should not be an indication that the most appropriate sources were chosen. The content of some databases maybe too general and too basic. This is particularly true for graduate students. Working as a librarian in an academic environment, there have been many occasions that I would tell a graduate student that a particular database probably would not meet his or her needs, but the student still chooses to use the database. Students seem to be more concerned with finding the adequate amount of relevant information and having the required number of sources, rather than being concerned about appropriateness of the information. There are many situations where there is no online database to fit a particular need. In this case, the printed information should be utilized, not some online database that has only a paragraph or so about the subject. Many databases in a typical academic library provide complete citations, abstracts, references, and full texts to many articles. Students can usually find all the information they need, including full text, with a few computer keystrokes. They, typically, do not have to copy the citation information, go find the specific volume and issue of a journal, read the article in the library or else duplicate it, and digest it for use in the project. They simply print out the information at the computer. Additionally, many assignments do not require that students be familiar with the different elements of a citation, simply because the citation information is provided online. Students are not required to know the difference between the title of an article and the title of the journal when they see it in a citation. Therefore, the citation itself has little meaning. Many students never see a printed index. Initially, many college students have limited knowledge of the research process and some of them think that any information they need is online if they just press the right key on a keyboard. They think everything is available through the Internet. Of course, this is not true. In rethinking the instructional process, we must ask ourselves if we are cheating students by not requiring them to physically see and use primary research items. To simply be familiar with the size, cover, and contents of a journal is beneficial. Perhaps parts the assignment should require that students actually use the printed journal, instead of the online counterpart.

There are many occasions when the information obtained online is incomplete. Although many databases provide the full text of many journal articles, the accompanying tables, graphs, formulas, and pictures are not always displayed and printed. Therefore, some of the information can be lost. This is generally not the case when using the print format of the journal . Although the article maybe current, relative, accurate, and logical, it is hardly complete without the accompanying images, tables or graphs. Another problem, especially if searching the Internet, is pagination. For citation purposes, it is important to know the pagination of a document. The actual page numbers of articles are frequently omitted, especially in web-based electronic databases or Internet. Consequently, the corresponding citation is incomplete, because there is no page number. It is difficult to imagine preparing to work in a specific field, but yet not being familiar with important or major publications in that field. It is difficult to accept the fact that so much research can be completed, without ever browsing the actual journals or books. Will students continue to be well versed and knowledgeable in their particular fields of study when they are not required to do much more than retrieve information from an online database? Sometimes, there is much to be learned from browsing other articles in the same journal title, even though this may not be required for an assignment. However, if students never see the journal, they are not aware of other articles in the journal. Becoming more familiar with important authors in a specific field of study is, also, worth the time and effort. Students will not browse through the pages of journals and books to become familiar with them, simply because this is not required to complete a specific assignment.

Some professors enforce the requirement that the information for a specific project be obtained from a professional or refereed journal. This requirement, while worthwhile, does not necessarily dictate that students will physically see the journal or other publication. Many databases provide a means to search from only journals that are refereed. Therefore, all the information that the student retrieves online comes from a professional journal and is usually a primary information source. Some professors require that students duplicate part or all of the pages of an article in a journal, to insure that students actually see the journal and do not rely totally on the computer. While the computer has drastically changed

Many people in the public sector think that information in electronic format is much cheaper than trying to buy the same information with so many books and expensive journals. Payment for information received online can either be the responsibility of the individual patron through special fees or the responsibility can lie with the institution. In any case, the information is not free. If the institution pays for access to a database, then this is indirectly charged to students. Sometimes, the individual student is required to pay as a database is accessed. Many vendors that provide access to databases in academic libraries, for example, also require that the institution purchase a print version of the information provided electronically. Quite often, the electronic format costs the same or more than the printed format, depending upon contractual agreements. Some contractual agreements for online databases limit the number of users. Whether the information is in print or electronic format, access to it is not free of charge. In academic institutions a large amount of money is required simply to design and maintain a network to provide access to information electronically. If this network is designed correctly, access to databases can be provided for about 80% to 90% of the time. If the network has a problem, there is a great chance that nobody can access the electronic information. Institutions, especially libraries, are constantly re-evaluating subscriptions to journals and other materials to ensure that their users get enough "Bang for their buck". In assessing our technological progress thus far, the price we pay for access to information should not be overlooked. Are the students getting their money's worth in terms of materials and service?

During the past few years I have encountered many students who think that specific journal articles they need to read are on the Internet. For some reason, they think that all they have to do is search the Internet and they will find the full text information at some site. Students simply do not consider using printed information, even though the printed source is more appropriate.

Some professionals argue that students are at least learning computer skills if they do their research online. It is true that the need for computer skills should not be overlooked. In our competitive environment good computer skills are required to enter a competitive workforce. With this in mind, schools try to prepare students by exposing them to a wide variety of computer courses, workshops and other assignments. However, most jobs do not require extensive computer skills, but rather a minimal ability to work with computers. College students need more in-depth assignments that require them to do more than press a few keys on a keyboard. Students need to see the books and journals to become familiar with their content and organization. The Reader's Guide to Periodical Literature is a very common index used in all types of libraries. It is alarming the number of college students who do not know how to use this index. Typically, students will come to the college library, sit down to a computer, choose a database and enter the term in which they are interested, and print out the text of the article. They never see The Reader's Guide to Periodical Literature or any other printed index, unless the computers are not operational. As a result, students are becoming less familiar with simple library reference tools-- their content, coverage dates and organization.

Last, but not least, is the issue of archiving or preservation. In essence, this indicates how information is preserved and made available for the future. How do we ensure that the information that we now have will be available for future generations? Preservation of information is very important, whether the information is in print or electronic format. However, for information in electronic format, preservation is a major problem. Try to imagine, if you will, that you have a citation from a paper that was completed five or six years ago. You wish to find the original textual information to verify a concept or theory. If the information originated from a site on The Internet, there is little hope of finding that site again to read the information. If the information were provided via some other electronic database five years ago, there is no guarantee that you have access to the same database today. If the citation originated from a printed source such as a book or journal, there is a much better chance of finding it. Are we teaching students to search, organize, and process information, which may or may not be available tomorrow?

Students should be taught how to appropriate time and resources through different stages of the research process, instead of just cutting and pasting or pointing and clicking. Assignments should be more thought-provoking, encouraging students to think, organize, and synthesize the information. Students should be making discriminating choices about appropriate sources to use for a research project, whether print or electronic. In assessing our technological progress over the past decade or so, we are at a critical point. We must make every effort to ensure that the next decade or century does not become known as, "The mad dash to technology". The technological revolution has drastically changed the way information is delivered and used. Computer technology is here to stay. The technological revolution has provided us with, not only the actual computer hardware of nuts, bolts, and electronic circuitry, but also, the necessary software. We are provided with little more than this, but how we utilize the computer is our responsibility. To capitalize on our accomplishments, we must thoroughly examine the instructional process, understand how computers influence learning, and be prepared to utilize alternative teaching strategies and resources.

The key to success in the 21st Century is that our youth be well educated, well trained and information literate. We must provide the resources and the structure for our students to achieve success, whether the information is in the form of books or bytes. We can build on past successes of the computer revolution, but we must constantly take time out and re-evaluate to effectively meet the challenges of the next century.

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The Other Data Center

Warren Murphy
University of Alabama Libraries
University of Alabama
Box 870266
Tuscaloosa, Alabama 35487

In the traditional sense we think about the "data center" as being or related to data processing (DP), information services (IS), or management information systems/services (MIS). There is significant difference between the processing of data to achieve a goal, such as a payroll system, which produces a paycheck and reports to the IRS, and the storage, retention, archiving, and retrieval of data as information. When we discuss the data center as a repository of information we can look at "the other data center", the library. As the amount of information, which must be considered, continues to increase, there must be new ways, new out of the old, to archive, retrieve, and deliver information. Information is of no use if it can not be located and the key to location of information is an indexing system. Libraries use such a system which is proven in its functionality and is being reviewed and updated to accommodate new data formats and larger amounts of information. Individuals trained in library and information science have much to offer the concept of information systems. Cooperation between the data center and "the other data center " can be investigated and opportunities of innovative solutions identified.

When we look at the data center as a repository of data, we can examine the types of data which are accommodated. In our campus environments we archive student information: personal information such as name, social security number, multiple addresses, multiple telephone numbers, and e-mail addresses, and so on. From an institutional viewpoint, we archive another set of data: student number, course of study, changes of course of study, course information such as credit earned and credit earned toward a major course of study. The list continues when a student graduates. At this point, the nature of data maintained shifts to new addresses, new telephone numbers, martial status, employer, and so on. The list goes on. As the amount of data retained increases, the need to retain greater quantities of data also increases. The increased amount of information to which an individual has access generates the need or desire for more information. Traditionally, these types of data have been considered a part of, or the object of, administrative systems. When the data is used it is within the system in an electronic format or it is transferred to a printed form to be used by the general public. As our technical working environment has changed, more demand has been made to make the information available to the public. Our users-- students, faculty, and staff-- have become accustomed to retrieving data/information using desktop tools such as browsers in "real time". The data being requested usually resides in different and sometimes incompatible systems. Different avenues are being followed to try to provide the requested information, all of which require programming skills and many personnel hours. New equipment and a network infrastructure is also needed in many cases to deliver the information. As attempts are made to provide access to the information, decisions must be made about the "system design" to accomplish the delivery. Interfaces can be produced that provide a graphical frontend, usually a browser, to provide access to information from different systems. The concept of data warehouses is also being used to provide access to information. [1][4] When data warehouses are used the quality of the data is a major concern. Whichever method is chosen determines the personnel time required to develop and maintain the systems, which in turn maintain or provide access to the data.

In our libraries of today the same demands are being made. There is a growing demand for data in electronic formats, in addition to, or in place of, paper formats. The issue of relevance, accuracy, and the narrowing of scope related to the use of data in electronic formats is beyond the scope of this work, but we must consider the efforts which are going into building digital libraries. The availability of data in electronic formats has a far-reaching impact on all disciplines. Research in storage techniques, compression techniques, information delivery mechanisms, and so on is pressing forward to make the archival of massive amounts of data feasible.

An observation by Laszlo Kovacs in his work, "Discovery of Resources within a Distributed Library", brings forth a major issue in this era of massive amounts of data and the access to said data:

> "Today, digital libraries are somehow hidden systems. They usually provide a short informal overview and a list of their digital document collections. Their search forms rarely provide structural views (and searching possibilities) of the collection. [2]

The dilemma of data centers dealing with the growing access requirements for data/ information can be applied to the opportunities for libraries to provide access to the growing repository of digital information. Library organizations and the profession of librarianship have a history of indexing and providing a cadre for information access. In this arena work is being done to keep up with the growing need for access to more and different types of data/information. The terms which encompass the work being accomplished include, but are not limited to, metadata, the Dublin core, the "856" field, tags, hot links, html, sgml, xgml, and so on. We can consider the integrated library systems available today and look at the mechanisms they provide to index and access information. In a very informal sense, we can describe the process as placing a tag (link) in the 856 field of a cataloging (index) record. The link "points" to an index, which in turn points to individual data elements. These data elements do not have to be bibliographic records associated with items housed in a library. The items can be pictures, audio clips, video clips, full motion video, search routines and so on. The list is endless, but let us take note that the information can be student information, financial information, alumni information or programmed search routines to extract this type request information from different systems in real time.

In developing and maintaining these library systems, libraries have to acquire the necessary equipment, and qualified personnel. Libraries have to build a library systems offices. [3] As the systems become more sophisticated, the skills necessary to take advantage of all of the possibilities of data archival, retrieval, and delivery become more diversified and extend beyond librarianship. Does this mean that libraries hire systems administrators, systems design personnel, network administrators, and programmers? Not necessarily. Look at what the library systems of today and librarians have to offer the data center in their effort to meet information delivery demands. Now look at what the traditional data center can offer libraries/librarians in terms of network design, systems design, systems administration, and programming expertise.
The time is at hand when the data center and the "other data center" can cooperate and accomplish common goals together. Decisions can be made about the size a library systems office needs to be, how the systems office should be staffed, the role librarians can play in the delivery of administrative data to the public, and where library systems and administrative systems meet, and so on. The answers are not proposed here. An agenda should be set forth to study, develop, and

implement the avenues of cooperation and to identify all of the benefits which may be achieved by both data centers.

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Microsoft Tutorials
Using Faculty Developed Tutorials to Enhance Software Instruction

Dr. Tom Murray
Professor
School of Business and Economics
Director of Technical Education and Training
Information Technology Services
Lynchburg College
Lynchburg, VA 24501
Phone: (804) 544-8265 Fax: (804) 544-8693
e-mail: murray_t@mail.lynchburg.edu

ABSTRACT

Because tutorials and training manuals are expensive and quite frequently not matched to college curriculums, faculty at Lynchburg College created tutorials for a number of application programs. The most recent tutorials were developed for Microsoft Excel 97, Access 97, PowerPoint 97, Front Page 98 and Outlook 98. Microsoft was impressed with these tutorials and granted a number of licenses to teach Microsoft courses, using these tutorials, to students, faculty, staff, alumni and the community. The tutorials are now "webbed" and available to all. A teacher curriculum has been designed around these tutorials for Virginia (state) Standards of Learning.

INTRODUCTION

In the late 1980's Lynchburg College shared a dilemma with many other institutions of higher learning. Computer application software was proliferating at a rapid rate and a number of companies were attempting to gain market share. There were many expensive manuals on the market for various software applications, some elementary some superb. Much popular and inexpensive software often did not have any manuals or tutorials. Regardless, the purchase price for commercial manuals and tutorials to a student was, in most cases, significant. The price of software for computer labs also varied considerably from vendor to vendor.

At Lynchburg College it was felt that a student, depending on discipline, should have a competence in word processing, spreadsheets and databases with that competence being more important than a specific "brand" of software. At that time Microsoft programs for these applications were fairly expensive, so the college chose to use WordPerfect and Borland Quattro Pro and Paradox for lab instruction. The average cost, for what was considered a decent manual, ran in the $ 30-50 range. Frequently, there was too much content in these manuals, and a great deal of it was not tailored to a general course. The decision was made to develop specific, general tutorials that covered the "most used" aspects of each software application.

DEVELOPMENT OF FIRST TUTORIALS

Since business faculty were the group most interested in spreadsheets, they undertook the creation of our first tutorial. A number of local businesses were studied to determine the most frequently used spreadsheet tasks. From this information a spreadsheet tutorial evolved for Quattro Pro. The tutorial was "tested" on student classes and in community training sessions. Changes were continually added to enhance content, usability and friendliness. Paradox database was the next tutorial created by the above "method" It too was "tested" on students and local businesses. After using the Quattro Pro tutorial for a semester, the accounting faculty at Lynchburg College were concerned that there were not specific tutorials for Income Statements and Balance Sheets; thus, tutorials were also created for these applications. As software versions changed, the tutorials were updated to include new features. The early tutorials were "all text" and were created for use in a computer lab environment where an instructor guided the students through each step of the tutorial. The students then repeated the tutorial, on their own, to reinforce their skills in the software. When the tutorials were included as a portion of the curriculum, it was assumed that, upon completion, students were basically proficient in specific software. Faculty then included additional assignments in their curriculums for specific software tasks, which significantly increased student competency.

ENTER MICROSOFT

In the early 1990's, Novell purchased WordPerfect and Borland. Corel then purchased Novell. It appeared, during this period, to the faculty at our college, that support, development and especially academic pricing changed significantly on the word processing, spreadsheet and database software. Coincidentally, Microsoft was emerging as the industry application software choice. Studies, whether local or national, by faculty, institutions or consultants, indicated that Microsoft programs were being used by well over 50% of firms. Also, the cost of Microsoft products to educational institutions became more appealing.

TUTORIAL CONVERSION

Our college, like many other institutions, makes operating system, hardware and software selection decisions in the spring so that the upgrades and enhancements can be completed during the summer. In the spring of 1995, when Windows 95 and Office 95 were available at academic pricing, the decision was made to shift to these programs for the next academic year. Over the summer of 1995, faculty at Lynchburg College "converted" the Quattro Pro and Paradox tutorials to Excel 95 and Access 95. This conversion did several things. The content of each tutorial was first altered to reflect the new mouse clicks and keystrokes that resulted from the change in software. Of more significance was the fact that the publishing industry was now producing tutorials and manuals with graphical representations of what the screen should look like at various steps in the tutorial. These tutorials still did not seem to cover the information that we desired, and they were still significantly more costly than those created in-house. So, during the summer we included "pictures" in our tutorials that supported the text. The reaction in the fall was positive and significant from students, faculty, staff and the community.

GROWTH OF THE TUTORIALS

PowerPoint

Prior to the 1995-96 academic year, Lynchburg College used, with the permission of Microsoft, a tutorial that was included in the Windows 3.1 – Version 4.0 manual for Microsoft PowerPoint. This tutorial was very effective and only copying costs were involved. When PowerPoint 95 was adopted, there was no tutorial included with the manual.

During the 1995-96 academic year a member of the School of Education and Human Development faculty had created her own tutorial for teachers; however, it was not formalized in any written form. The professor simply instructed students in a computer lab as to which buttons to click and what text to type and would then use a similar approach to enhance the presentation with graphics, sound, transitions, and builds. This tutorial style was so popular that a business professor requested the education professor to formalize her tutorial in Microsoft Word. After receiving her text, he then inserted the appropriate screen images from PowerPoint 95 to enhance the tutorial. This tutorial was tested on several business and education classes. Their comments and suggestions were then included in the final draft that was produced in 1996.

CONTACT WITH MICROSOFT

During the late spring of 1996, at an American Association of Collegiate Schools of Business technology conference in Boston, the business professor approached the lead Microsoft presenter and questioned why Lynchburg College had never received any significant grants. The professor indicated that all pertinent instructions had been completed, yet no funds were forthcoming. The lead presenter furnished his e-mail address to the professor and requested a detailed reconstruction of the past several grant applications. A response was quickly forthcoming which furnished a Microsoft contact person in the appropriate grant area. During an initial phone conversation, the Microsoft contact indicated her surprise that Lynchburg College had not received a grant. She was also impressed that the college was using "in-house" created tutorials to train students, faculty, staff, the community and students attending the state Governor's School for Math, Science and Technology. A grant was quickly furnished for several computer labs.

The Microsoft grants person requested copies of the Microsoft tutorials for review and comment. Several Microsoft area managers quickly indicated their satisfaction with the tutorials, further indicated that they would probably, at some point, link to the tutorials through their web site. The Excel and Access 95 tutorials were satisfactory as published. However, there were a number of additional enhancements that the Microsoft persons indicated would make the tutorials stronger. These enhancements were then incorporated into the tutorials.

Front Page

During the "early days" of web page creation, Lynchburg College, like many other institutions used a number of different products to create web pages. Some were free from the Internet, and some were commercial. At one point, the college purchased six different commercial web page authoring programs for six different professors, each being responsible for becoming proficient in their software. The six programs were then compared on their ease of use, capabilities and tutorial support. No one package seemed to be totally acceptable, so most web authors simply continued to use the HTML method with which they were most comfortable. This continued until Front Page 98 entered the market with the Editor and Explorer modules. Editor was used to edit individual pages, and Explorer to create and edit web sites composed of multiple pages. During the spring of 1998 the popularity of Front Page 98 among our faculty rose significantly, and they asked that a tutorial which "covered" all of the basic steps for creating a web page be created. The students and faculty who were creating web pages at that time were asked to list the items that should be covered in a Front Page 98 Editor web tutorial. This list included inserting and editing text, inserting, moving, sizing and editing pictures and clip art; inserting sounds; creating backgrounds and creating hyperlinks. Also included were how to acquire, legally, backgrounds, pictures, clip-art, animation, and sounds from the Internet.

The Front Page 98 Editor tutorial began as a text document with examples of how to enter and edit text. Next, a digital camera was utilized to take the picture of the person using the tutorial. The picture was inserted and sized and examples were furnished on image placement and word wrapping. If a digital camera was not available, a scanned photograph or any image could be utilized. The tutorial then gave instruction on how to access the Internet and save pictures, clip art, animation objects, backgrounds and sounds. Several web sites were contacted to determine if they would allow their inclusion in the tutorial. Once permission was granted, the Internet addresses of these sites were included in the tutorial. A number of faculty (especially English), as well as the two sites, indicated expanding the description of web plagiarism was next enhancement of this tutorial. Throughout the tutorial it was continually stressed that all of the various pictures, sounds, etc., must be in the same "folder" in order that they can be "found" when inserted. This was further stressed as hyperlinks were created to items saved from the Internet. After hyperlinks were created to the student folder, hyperlinks to the Internet were addressed. As with previous tutorials, this tutorial was student, faculty, staff and community tested. Enhancements were made as suggested and the Front Page 98 Editor tutorial was included as a part of Microsoft workshops.

As users of the Front Page 98 Editor tutorial became proficient in creating, editing and linking individual web pages, a demand for a tutorial using Front Page 98 Explorer to create complete web sites was requested. Front Page Explorer will probably be the next tutorial created. We may wait until Office 2000 is available to commence this task.

Outlook Mail

Like many institutions, Lynchburg College has used several e-mail systems in the past. The earliest system was Digital VAX mail. This was primarily a text based e-mail system. As the popularity of including graphics and file attachments grew, several other e-mail products were tested. For several years faculty and staff used the Pegasus system. However, as Domino Server - Lotus Notes and Microsoft Exchange Server - Microsoft Outlook became the dominant e-mail systems for business and education, our college established a review group that utilized Outlook 97. The review group recommended that the faculty and staff adopt Microsoft Outlook 98 as the campus e-mail standard. Once this decision was made, it was requested by the administration that a tutorial "tailored" to our campus be created.

In the spring of 1998 the review group produced a "list" of topics that should be covered in an introductory Outlook Mail 98 tutorial. That list included:

Creating, editing, sending, and receiving mail
Adding/deleting addresses in the Personal Address Book
Creating and using folders in which to save mail
Adding/sending/receiving/viewing/saving attachments
Personal Distribution Lists
Moving, deleting, recovering mail messages
Personal Calendar, Out of Office Assistant, Auto-signature,
Using Microsoft Word as the editor

The first Outlook 98 tutorial was created from this list.

During the 1998 summer period, 85 % of the faculty and staff elected to "move" to Outlook 98 mail. Training sessions in college labs were arranged and conducted during the summer using the Outlook 98 tutorial. Some 200 faculty and staff were trained with the tutorial.

The tutorial was well received; however several changes were requested. A number of persons desired a more detailed section on the various screen Views available to display e-mail messages. Also, a small group requested a more detailed explanation on how to place e-mail addresses in the Personal Address Book and add addresses to a Personal Distribution List. There has been considerable interest in the Calendar feature in Outlook 98, especially the scheduling, "automatic" notification, and inclusion in personal calendars of scheduled meetings. It appears that a "sub-tutorial" on the Calendar may be needed.

CONCLUSIONS

The set of seven Microsoft tutorials has been proven over time. They are enhanced periodically to reflect the requests of the faculty that utilize them in labs and students who desire more detail and content.

The financial savings have proved significant. Because tutorials average about 25 pages, and are on our web, students can make as many copies on their printers or our lab printers as they desire. Normally the tutorials are furnished as an integral portion of various courses. At about five cents per page, the normal tutorial costs about $ 2.50 - 3.00 a copy. There has been some thought given to locally producing a "manual" composed of all the tutorials and selling it in the bookstore. However, few courses utilize all the tutorials, so this has not been done. The flexibility of producing those tutorials applicable to a course has strong support.

The next major undertaking will be to update the tutorials when Office 2000 becomes available. Work will commence this summer.

The tutorials can be downloaded from: http://www.lynchburg.edu/userguide/

Working With Microsoft
Optimizing Microsoft Grants Received by Institutions

Dr. Tom Murray
Professor
School of Business and Economics
Director of Technical Education and Training
Information Technology Services
Lynchburg College
Lynchburg, VA 24501
Phone: (804) 544- 8265 Fax: (804) 544-8693
e-mail: murray_t@mail.lynchburg.edu

ABSTRACT

Microsoft annually announces various grants for selected disciplines. In awarding the grants they look for aspects of a curriculum that make an institution unique. They ask how will an institution utilize their software in a manner that is beneficial to the institution and surrounding community, while also providing positive publicity for Microsoft and the institution. In working with Microsoft, certain strategies have evolved which strengthen the grant application process. Providing appropriate supporting grant data enhances the probability that a grant will be furnished. This session will describe the continually evolving grant process.

INTRODUCTION

During the 1996 academic year, Lynchburg College and other institutions received via mail and e-mail an invitation to apply for a grant under the Microsoft Instructional Grant Program. These grants awarded specific Microsoft site licenses to institutions based on the use of a product in an academic course. Microsoft Office 95, Windows 95 and various Visual programming products were included in the grant. Institutions were required to substantiate requirements by completing a Microsoft transmittal form which furnished information about a course, the institution, and the faculty member teaching the course. A syllabus was also a part of the grant. Institutions that received the grants gave permission for their syllabi to be published on the Instructional Grant web site where other institutions could review them for suitability to their requirements.

Lynchburg College applied for a grant in 1996. The grant was not received, but a "mentor" at a successful grant institution was assigned, by name, to assist the college in preparing a grant during the next grant cycle. On numerous occasions the college attempted to contact Microsoft and the mentor to determine why a grant had not been received and how to prepare for the next grant cycle. The only information provided to the college about its unsuccessful application was that the "forms" had not been completed satisfactorily.

The 1997 grant cycle began and no reply had been received after multiple queries to Microsoft and the mentor. The various forms and syllabi were once again submitted for 1997. The Lynchburg College submission appeared, at least to the Lynchburg College submission group, to be identical to successful grants that other institutions had submitted in 1996. Again the grant was rejected. This time there was no indication as to why the grant was not forthcoming, nor was another mentor assigned. Again, queries to Microsoft went unanswered.

A NEW APPROACH

During the summer of 1997 a member of the School of Business and Economics faculty attended an American Association of Collegiate Schools of Business (AACSB) technology conference in Boston with Boston University, Harvard and MIT hosting the conference. Because of the status of the sponsoring institutions and the AACSB, a number of large commercial firms were represented - including Microsoft. Throughout the conference Microsoft hosted sessions on many of its software products. The marketing manager responsible for these sessions made himself available after each session. During one of these sessions, the Lynchburg College representative asked the Microsoft representative if he was familiar with the Instructional Grant Program and the representative indicated that he was. The situation described above was presented to the representative. In addition, it was stressed that not only were our syllabi similar to institutions that received grants, our growing group of Microsoft tutorials supported the syllabi. The representative showed significant interest during the discussion and requested that an e-mail outlining the scenario for the past two years be sent to him. He indicated that he would have the appropriate Microsoft grant person contact us. Several days later the college was not only contacted by e-mail, but also by phone.

The Instructional Grant Program coordinator indicated the she had reviewed our submissions and was puzzled by our non-receipt of a grant. She stated that she would have one of the reviewers look over our submissions again and determine if any grants could be forthcoming. Several weeks passed without contact. We were again concerned that we were again in a mentor-Microsoft dilemma. The grant coordinator was again contacted and this evolved into a two-hour phone conversation. During this conversation the coordinator indicated that the college needed to provide some aspect of its curriculum that was unique, and would bring both Microsoft and the college positive publicity if the grant was forthcoming.

Several aspects of our college program were mentioned. First, during the summer of 1997, Lynchburg College would host the Governor's School for Math, Science and Technology for Virginia on our campus. The high school students would utilize a number of Microsoft programs throughout the curriculum. The students would also use the Lynchburg College Microsoft tutorials where appropriate. Second, the mention of the tutorials interested the grant coordinator who indicated that others managers at Microsoft might be interested in the tutorials. She indicated that she would pass this information along to those persons. There were also several educational workshops for teachers and counselors planned for the 1997 summer where Microsoft and the tutorials would be utilized. The grant coordinator indicated that the college should quickly submit a short, several paragraph grant request supported by the projects just mentioned. Within two weeks a significant grant was received. The grant furnished a number of site licenses for major computer labs where the instructional sessions would be offered. It included Windows 95, Office 95 Professional, and Visual Basic software.

During the lengthy conversation it was explained that our college, in various service and outreach activities, offered the charitable community, at no cost, instruction in Microsoft software. At that time Microsoft was considering a grant program that would provide software to charitable institutions, the educational institution furnishing instruction, and the persons providing the instruction to the charity. The Lynchburg College Microsoft tutorials entered the forum once again. Since our college appeared to already "fit" the program being considered, Microsoft product managers requested that we provide a proposal as to how we thought such a grant program should work. It was agreed that we would furnish copies of all tutorials to Microsoft for review and provide our recommendations on how a charity-grant program might work.

Several grant areas within Microsoft enthusiastically received the Access, Excel and Power Point 95 tutorials. Initial comments supported further development of these and additional tutorials. Several Microsoft coordinators and managers indicated that at some point they would link some area of their web site to the tutorials.

CONTINUING THE RELATIONSHIP

At the end of the 1997 summer, a detailed report was provided to each Microsoft manager who had indicated interest in the Governor's School and education workshops. Copies of syllabi and projects completed by teachers and counselors were sent in a package to Microsoft. In addition, the web site created using Front Page 97 was provided, as well as syllabi, and copies of many class projects. All information was received enthusiastically. Coincidentally, at the end of the summer the college agreed to migrate to Office 97 professional. The college, due to the success of the Microsoft tutorials, supported a migration to Office 97 tutorials. The enhancements were not as time consuming as the creation of the original tutorials since Office 95 and 97 were similar in many ways.

During the fall of 1997 and spring of 1998 phone and e-mail conversations were conducted on a regular basis between faculty at Lynchburg College and various Microsoft managers. Ideas and information was shared on a regular basis. By the spring of 1998 the college had forwarded a number of "thank you" packages of college store items to each supporting manager. Thus, no formal grant was applied for in the spring of 1998. The college formulated a program for the summer of 1998 and indicated to the managers the scope of the plan. They once again requested that a supporting e-mail request be forwarded to them. In response, new site licenses were again provided.

During the spring of 1998 the managers, with whom we were in contact, indicated that a new grant program was being initiated for institutions with education colleges/schools/ departments. The name and contact information were provided for the manager of the new program. By contacting the manager directly by phone and e-mail it was determined that Lynchburg College already had in place several teacher computer education programs which would qualify for grants. Instead of applying for a grant that the college hoped would grow into a program, the college supplied as a part of the grant, two entire programs supported by the tutorials. The maximum number of licenses that could be requested were received. At the end of the summer, a detailed report of activities was once again forwarded to interested managers at Microsoft. Once the summer sessions are completed, the software remains in the labs for academic classes and training sessions.

PRICING

Once an institution receives grants, it is also provided very favorable educational pricing. This pricing provides the lowest price on Microsoft products to an institution, and its faculty, staff and students.

CURRENT RELATIONSHIP

Each fall Lynchburg College hosts a Gala for its major donors. The theme for the 1998 fall gala was "The Ivy Covered Computer - Bringing the liberal arts into the 21st century." The college invited each of the area managers and the Microsoft educational representative for Virginia. While the area managers were unable to attend, the Virginia representative accepted. During the Gala the college president singled out Microsoft for their significant and continuing support.

As this session paper is being written the college is once again formulating its request for the 1999 summer workshops and academic year classes. During our initial e-mails and conversations the Visual manager indicated that another grant area had been created for computer science courses. The Authorized Academic Training Program will not only provide the student a grade in a Microsoft computer language course, but will also provide a Microsoft certification in that course. The faculty will be Microsoft Trained and they and the institution will be granted Microsoft licenses for the course. As fate would have it, one of the initial grant manager contacts is now the manager for this program.

During these "conversations" a request for a Microsoft representative to be a part of this session of the ASCUE conference was also initiated.

Internet Addresses for Microsoft Grants referred to in this paper

The Academic Cooperative - Curriculum Grant Program

http://academicoop.isu.edu/grants

Teacher Training at Microsoft - Integrating Technology into Today's Classroom

http://www.microsoft.com/education/training/

Microsoft Authorized Academic Training Program

http://www.microsoft.com/aatp/

Samba: Bringing the Mountain (Linux) to the Molehill (Windows 95/98/NT)

Don Olive
Physics Department
Campbellsville University
UPO 1265, One University Drive
Campbellsville KY, 42718
Campbellsville University
don@campbellsvil.edu
http://www2.campbellsvil.edu/~don
(502) 789-5243

Abstract

The success of Microsoft's Windows and the DOS family of operating systems has resulted in an incredible popularity of the Session Message Block (SMB) network protocol. This protocol has several server and client implementations, including NetWare, Windows for Workgroups, Windows 95/98, Windows NT, and the Samba Suite for Unix. SMB is a protocol for sharing files, printers, serial ports, and communications abstractions such as named pipes and mail slots between computers. One of the most exciting uses of the SMB protocol on the horizon is the Common Internet File System (CIFS) protocol, an enhancement of basic SMB.

This talk will introduce the SMB protocol's implementation as it is realized in the Samba Suite for Linux and describe how one can use Samba to do anything Microsoft's Windows NT can do, but on a fast, stable, full-featured operating system. As of the most current release, Samba can even integrate into an existing Windows NT domain as a backup server. One of Samba's best features will be emphasized, that it is licensed under the GNU General Public License, making it free software.

(Don's paper was not available at the time the Proceedings went to press. He will supply copies of his paper at his talk or provide a url if it is posted on the web.)

Using TQM in a Computer Lab to Enhance Student Satisfaction

Julie A. Phillips
Assistant Professor Organizational Leadership and Supervision
(812) 348-7202
jphillip@iupui.edu
Dewey A. Swanson
Assistant Professor Computer Technology
Purdue University
4601 Central Avenue
Columbus, IN 47203
(812) 348-7238
dswanson@iquest.net

Introduction

TQM is a philosophy that can be applied to any aspect of work or life. With this philosophy one can transform the way work is performed to meet customers' needs, besides delighting the customer. At Purdue University School of Technology, the Columbus, IN campus, the TQM philosophy is being applied in the computer lab to try to better meet the customer (student) needs.

This paper is a continuation of TQM work that was started in the spring of 1997. A student satisfaction survey was distributed during that year and changes were made to the computer lab based on the results. In order to measure improvements and to continuously improve, another student satisfaction survey was distributed in the fall of 1998. Thus, this paper is comprised of improvements made since the 1997 survey, and new areas of opportunity identified by the 1998 survey.

Background of School

Purdue University School of Technology at Columbus, IN (PST) is a unique partnership between education and business, industry, and government. It was established, along with eight other regional campuses, to meet Indiana's need for trained technologists and technicians. The curriculum at the Columbus campus is identical to Purdue University at West, Lafayette, IN.

PST is located at the Indiana University Purdue University Columbus (IUPUC) campus. IUPUC is part of the Indiana University regional system. PST partners with IUPUC to offer eight-degree programs. There are 1900 students at this campus, of which over 300 are PST students.

Background of Computer Lab

The two PST labs include 47 PCs and two printers. Of the 47 PCs, 25 are Pentiums and 22 are 486 machines. IUPUC provides one lab and PST provides the lab assistant. The labs are in 3 physically adjacent rooms, with windows in between the labs. This allows one Lab Assistant to cover all 3 labs.

Background of Computer Personnel

PST maintains two computer labs that are available to PST students, as well as IUPUC students. PST has an Information Technology Manager, Head Lab Assistant, and student Lab Assistants.

The Information Technology Manager's duties include managing hardware/software resources for the campus. This includes labs, faculty and staff machines.

The Head Lab Assistant's duties include: hiring, training, scheduling, installing new hardware and software, troubleshooting hardware and software problems, resolving problems, managing the PST lab file server, writing and posting lab related documentation (both user and employee-based), and maintaining the lab environment.

The Lab Assistant's duties include: providing assistance to lab users, answering questions, trouble shooting hardware and software problems, assisting in hardware and software installation. Lab Assistants must have taken an introductory computer class, with basics in Windows and Microsoft Office toolset, or have equivalent knowledge. They must also possess good interpersonal skills and be willing to work set hours. Each semester there are approximately 6-9 lab assistants.

TQM Approach

The Sample

A sample of students at the IUPUC campus was surveyed, concerning their satisfaction with the computer labs. The surveys were distributed to students in various majors and class standings. The majors that were represented include computer technology, organizational leadership and supervision, business, education, nursing, undecided, and other. There were 282 respondents, compared to 100 respondents in the spring 1997 survey.

The Survey

The survey followed the Likert-Type format. It contained 22 questions that the students were to rank form 1 to 5. The range was from strongly disagree to strongly agree. The questions were broken into the following quality dimensions: lab facilities, lab assistants, and hardware/software. Other sections of the survey included: demographics, general comments, and suggestions for improvements to the process. (See attachment 1)

The Results

Demographic Results:
(Majors) - fall 1998 survey, 29% other and 18% Computer Technology. Spring 1997 survey, 35% Computer Technology and 25% Organizational Leadership and Supervision.
33% sophomore and 29% freshman.
(Frequency of the Lab Use) – fall 1998 survey, 32% less than once a week and 29% 1-2 times a week. Spring 1997 survey, 41% less than once a week and 25% 1-2 times a week.
(Times Used) – fall 1998 Survey, 8:00am - 4: 30pm weekdays and 4:30pm - 10: 00pm weekdays. Spring 1997 survey 8:00am - 4:30pm weekdays.

Quality Dimensions Results:
The data for the quality dimensions (Lab Facilities, Lab Assistants, and Hardware/Software) is represented by bar charts, displaying questions that represented 35% or greater of the respondents, with a rating of 1, 2 or 3 (strongly disagree, disagree, undecided) Each bar graph will show a comparison between the 1997 and 1998 surveys.

(Lab Facilities: see attachment 2) - The two questions that scored 35% or greater were questions 2 and 3.

2. The lab facilities are comfortable (temperature, chairs, desks).
3. There are ample facilities for use (computers and printers).

(Lab Assistants: see attachment 3) - The questions that scored 35% or greater were questions 1-5.

1. Lab assistants are available when you need help.
2. Lab assistants are easily identifiable.
3. Lab assistants are knowledgeable about software problems.
4. Lab assistants are knowledgeable about hardware problems.
5. Lab assistants explain the problem so that you can correct problems yourself in the future.

(Hardware/Software: see attachment 4) - The questions that scored 35% or greater in the 1997, but less than 35% in the 1998 survey were questions 3 and 4.

3. Computer performance is good.
4. Computers and printers are up to date.

Analysis

The lab facilities category remains consistent between the 1997 and 1998 survey. The comfort of the chairs and the temperature of the labs appear to be an area of concern for many students. One way we hope to alleviate this problem is through the help of a local Fortune 500 company. Purdue is currently in negotiations to lease the computer labs to a local Fortune 500 company, when they are not in use by the university. Since the current computer lab would not accommodate this extensive use, 5 days a week at 7 hours a day, the negotiations are to have the Fortune 500 company update the lab facilities, i.e. replace the existing chairs and upgrade the heating and cooling systems. Hopefully by improving these two areas, the students' satisfaction with the lab facilities should increase.

The lab assistant's category remains consistent between the 1997 and 1998 survey. After the 1997 survey many changes were made to help with the student satisfaction in this category. Following are a list of the changes:

1. Nametags for the lab assistants and the head lab assistant were created that identified the person's name and function. These were to be worn at all times, while on duty.
2. Name plates, i.e. "Lab Assistant" and "Head Lab Assistant" were displayed on the respective desks in the computer lab.
3. The head lab assistant generated a list of skills necessary for the lab assistants. This skill list is used in the interviewing process and the training process of future lab assistants.
4. The head lab assistant scheduled a beginning of semester meeting with all the lab assistants to review training, scheduling, team building, changes to the lab, and general information.

The above solutions were implemented successfully, however they did not solve the problem, as is evident by the data on the 1998 survey. It begs the questions; did we solve the wrong problem? The data suggests that there is a problem with the students' perceptions of the lab assistants, but what is the problem(s)? Is the problem a structural problem? For instance the lab assistants and head lab assistants sit off in a room separate from the labs. Does this physical layout intimidate students? Do students not realize that the people in the offices are the lab assistants and the head lab assistant? Based on our data that most of the students were sophomore or freshmen could support this idea. Since they haven't been on campus very long, are they familiar with the layout of the lab? If students haven't had a computer course that requires them to be in the lab, but are using the labs for personal computing, they might not be familiar with the lab structure and perceive the environment as not being "helpful".

Could the problem be with the questions? Do they not measure what they were intended to measure? For instance, instead of a question stating, "Lab assistants are available when you need help", the question(s) might state, "When I needed help from a lab assistant, he/she was available for help". This puts the responsibility back on the students and makes it more personal. Or "When I went to the lab assistants/head lab assistants office for help, they were readily available?" One more example might be the question that asked if the lab assistants were knowledgeable about software problems. Maybe the question(s) should read, "When I experienced problems with my e-mail account, the lab assistant was very knowledgeable" or "When I experienced problems printing from Microsoft Word, the Lab Assistant was very knowledgeable." The data suggests that there are issues with the lab assistant's category, however with the current questions it is hard to determine what those issues are. Maybe the solution is to revise the questions and make them more specific.

The hardware/software category showed marked improvement in the 1998 survey. This is due to changes that have been made since the 1997 survey. The biggest change has been the hardware upgrade of one computer lab to Pentium 200 machines with 32MB of memory. This compares favorable with the 486 class machines with 16MB of memory that was in place last year. This upgrade, although desperately needed was totally unexpected. The money available came from surpluses in the capital spending account at the end of the year. Another result of the available money was a memory upgrade in the secondary computer lab. The 486 machines were upgraded from 16MB to 32 MB of memory. The Purdue server was also upgraded from a Pentium 50 with 750-MB hard drive to a Pentium II with 9.6 GB hard drive. A new laser printer was added to a lab, eliminating the need of the two adjacent labs to share a printer. Finally, the network wiring was upgraded to 10baseT in September 1998.

The upgrades to the hardware within the last year have made it possible to upgrade software and change the way the software is installed. Windows NT has replaced Windows 95 as the operating system in the labs. This has led to a more stable environment and has allowed more control by the system administrator. With the larger hard drives on the upgraded machines, software that in the past had to be swapped is installed permanently. This is still required in the secondary computer lab. Software that was originally on one or two machines in the lab is now installed on the server to allow access to a larger number of students. This includes the software packages AutoCAD and Pspice. All the upgrades have made the workstations and server faster and provide a more stable environment for the students.

The data suggests that these changes to the hardware/software after the 1997 survey improved the students' satisfaction level.

Next Steps

It is evident by the survey data that the lab assistant's category needs more work. Following is a list of proposed actions:

1. Share data with the lab assistants and the head lab assistants.
2. Rework the survey questions in this category.
3. Distribute these questions to a random sample of students.
4. Compare the results with the 1998 survey.
5. Brainstorm possible solutions.
6. Implement solutions.
7. Measure results.
8. Redistribute original survey in two years.

Conclusion

Over the past two years much activity has been completed to better understand the student (customer) perspective in regards to the computer lab. The surveys were used as a tool in order to gather pertinent data on the specific lab categories (lab facilities, lab assistants, and hardware/software). The data was then analyzed, and the end result, changes were made.

A lot was learned over the past two years. First, the physical setting/environment of the computer lab is a concern to students and their satisfaction, i.e. comfortable chairs and the temperature. Second, the elements that were implemented for the lab assistant's category after the 1997 survey had no measurable effect. This forces us to re-examine the data to get a better understanding of the issues. We learned that we can fix the wrong problem perfectly. Lastly, that the students appreciate having the latest hardware/software available in the lab. Also we learned that the solution to this problem and the lab facilities category are very contingent up capital spending, which is an area that we have minimal control over.

In the spirit of continuous improvement, the efforts to improve the computer lab will continue. There is much enthusiasm on the part of the head lab assistant and the lab assistants to continue this work. The adage, "If it ain't broke, don't fix it", we ignored. We broke it, and are continuously improving it.

TECHNOLOGY EDUCATION CURRICULUM ASSESSMENT: THE COMPLETE PACKAGE

Dr. Thomas A. Pollack
A.J. Palumbo School of Business Administration
Duquesne University
Pittsburgh, PA 15282
(412) 396-1639
pollack@duq.edu

ABSTRACT

With the current rapid rate of technological change and the associated modification and growth of course offerings in information technology, educators can easily become consumed by the technology aspect of a program of studies and ignore the general education component. The curriculum package as a whole must be constantly monitored to ensure that we are providing educational programs that prepare our students to function in the twenty-first century. This paper will discuss the balance that must exist between the technical and general education components in a program of studies. The paper will pose questions related to the assessment of educational outcomes. The paper will also report on the relative importance of general education competencies as recently assessed by several corporate advisory boards.

INTRODUCTION

In a recent study involving experts from 120 companies, universities, and national laboratories, the Washington, D.C. – based Council on Competitiveness reported the following: (Holmes, Horn, and Smith, 1998).

> In 1996, the Information Technology (IT) Industry represented 6.1% of U.S. GDP and employed 4.3 million workers with an average wage 73% higher than the average private sector wage.
>
> The U.S. IT industry created close to 250,000 new jobs between 1995 and 1996.
>
> World-class universities in the U.S. attract, train and graduate the best and brightest internationally.
>
> People are the critical link to competitiveness.
>
> Recent international studies indicate that the majority of U.S. high school graduates are not prepared to enter the workforce or pursue advanced education, as they do not stack up well in math and science against the rest of the world.
>
> Although demand for skilled workers is reaching an all-time high, university enrollment in

IT and related disciplines is down.

Each of the above points is significant to technology educators. However, the focus of this paper will be the overall technical and general educational preparedness of our students. How can we, as educators, design and maintain curricula that will help the U.S. maintain a global competitive edge in the technology sector?

ACHIEVING THE PROPER CURRICULUM BALANCE

Today's successful information systems professionals must demonstrate strong analytical and communication abilities along with a willingness to participate in life-long learning. Our educational programs can equip students with the foundation knowledge and skills necessary to begin careers as information systems professionals; as professionals however, they must have a commitment to continue the learning process throughout their careers. In addition to technical expertise, information systems professionals must also demonstrate excellent "soft skills". General communications, interpersonal and organizational skills are extremely important in the management of people, in the negotiation process, and in interdepartmental and inter-business dealings (Pollack, 1997).

Educational programs in computing and information systems cannot be static. The field is changing and evolving rapidly, and all indications are that it will continue its rapid rate of change in the future. For years, businesses have wrestled with the reluctance of people to want to change. Educational programs, especially those related to technology, are faced with many of the same problems. Faculty wish to continue to teach the material that provides them with a "comfort zone", often at the expense of the preparedness of their students. It is difficult for many information systems faculty to be aware and to maintain pace with the rapid rate of change in the field. To compound matters, many institutions do not have adequate budgets to maintain hardware or software currency in their computer laboratories. In addition to serving our students, there are other reasons that make change an important consideration (Ibid.).

The question then becomes, How do we build a process for assessing our curricula and implementing those changes that are appropriate? Where is the fine line that separates education from training? Efrem G. Mallach (1996) contends that we should teach students to work and live during technological change while maintaining evolving curricula. He states that graduates need the skills to get the first job, but more importantly they need the capability to keep learning. Today's technology environment, however, insists on some exposure to current hardware and software tools. The rapid changes that have occurred in information technology over the last several years make it imperative for us to constantly examine our curricula for currency. The basic economic law of supply and demand has created a tremendously rewarding employment environment for those with the proper skill set or experience. It is truly an employee's market, and by being astute innovators with our curricula, we can ensure that our graduates can receive a quality education and also be competitive in the marketplace.

THE TECHNOLOGY CURRICULUM

The rate of technological change in recent years has been overwhelming. Futurists, educators, business leaders, and IT professionals are making valiant efforts to predict what the future holds. A very recent *Computerworld* Special Report sought the opinions of 26 Chief Information Officers (CIOs) for their opinions on what the IT organization may look like over the next five years (Saia, 1999). Although opinions varied somewhat, there was general consensus that the rapid rate of change in technology will continue and tomorrow's organizations, to be successful, must adapt to the changing environment. Changes will impact three major areas: the organization, the people, and the technology. The trends with a likely impact on the organization include more responsibility for end-user computing, centrally managed technology, skills gaps combated by outsourcing, an emphasis on project management skills, a more strategic role for CIOs, better relationship management with business units, IT learning beyond technical training, better reaction to change, and a higher profile for IT across the organization (Ibid.).

Many believe that IT will assume a strategic function rather than a supportive one in the new millennium. People who can speak the language of business as well as the language of technology are likely to be tomorrow's organizational leaders (Fryer, 1999) Human capital will continue to be our source of competitive strength and the integration of software and business process competencies is becoming more crucial to competitiveness (Holmes, 1998). People who will rise to the top of their organizations will likely have skills in areas such as project management, enterprise resource management, systems engineering and database management. Companies will likely retain people with critical skills and outsource legacy system maintenance as the shortage of IT workers is expected to continue (Fryer, 1999). The shortage of IT talent is being amplified by the fact that college students are not choosing IT-related educational programs, even though the opportunities for well trained graduates is quite good. A recent report issued by the American Electronics Association indicated that high-tech degrees declined five percent between 1990 and 1996 (CNN Interactive, 1999). Ivens (1998), writing in *Windows NT Magazine,* reported that statistics compiled by the Information Technology Association of America and the U.S. Department of Commerce indicated 350,000 job vacancies for skilled technology workers; up from 181,000 vacancies in 1997. Add to this the fact that IT professionals are very mobile and continually look for new companies that will keep them trained in new technologies. There is a general sense that the most successful organizations in the future will have systems people integrated in the business units and more business people employing analytical thought processes.

Market Data Group LLC in Framingham, Massachusetts reported that four main technology areas would have the most impact on the future of organizations (Burden, 1999). In general, the areas were identified as network infrastructure (where enterprises are closely tied to suppliers and customers); electronic commerce (a shift from business to consumer to business to business); reusable code (reuse opportunities must be linked to human infrastructure); and technologies to support mobile workers (Gartner Group projects that by 2003, one-third of the U.S. workforce will be accessing servers remotely, and 50% will still be using dial-up connections). Each of the above areas presents a challenge to organizations in their efforts to remain competitive.

As we contemplate changes to the technology aspect of our curriculum, many of the above points are relevant and may help to re-shape how we structure and deliver our courses. However, other conclusions related to the general education portion of our curriculum can also be drawn from the above projections. The overall strength of our educational programs is determined, in large part, by the strength of our complementary general education component. As we make every effort to maintain currency in our technical curricula, it is quite easy to overlook what we offer in our general education program.

Several key points from above lend themselves directly to the general education aspect of our programs. Better communication skills have been in demand since the founding of our country, and it is likely that organizations will continue to rank the ability to communicate at the top of their lists. The quality of human capital will continue to be a competitive force. But more specifically, executives are identifying trends and needs in the areas of project management, relationship management, IT learning beyond technical training, better reaction to change, people who understand both business and technology, and the effective integration of "business" people with "technical" people. Each of these areas can be substantially enhanced through coursework that our institutions are already offering. The question is how to effectively meld the technical and general education curricular components together.

The next section will describe some of the criticisms and remedies being discussed by educators in the liberal arts.

THE GENERAL EDUCATION CURRICULUM

Most of our college catalogs contain a description of liberal arts education. The description is likely to identify matters such as liberal learning and intellectual perspectives. Liberal learning is likely to address the acquisition of communication and intellectual skills and a general framework of knowledge. The development of intellectual skills typically addresses the notion of understanding enough about principal areas of human endeavor to continue learning in the future.

Richard H. Hersh in *Solving the "Practicality Gap"* (1999), analyzes and summarizes the results of a survey conducted by Hobart and William Smith Colleges with the support of the AT & T Foundation. The purpose of the survey was to learn more about the disaffection with liberal arts colleges. At the advent of the 20th century, 70 percent of college students were attending liberal arts colleges; as we enter the 21st century, that figure is now below five percent (Hersh survey, 1999). Higher education is now seen as the only way to achieve financial success. The survey indicated that 75 percent of parents and 85 percent of college bound students believe that the ultimate goal of college is to get a practical education and secure a first job (Ibid.). Other key findings from the survey include the following: (Ibid.)

Few people believe in the importance of learning for the sake of learning.
Parents and high school students have little idea what liberal arts education is.
Few groups have positive feeling toward liberal arts education.
Business executives have greater faith in a liberal arts education than do parents.
Liberal arts colleges should teach workplace skills.
A substantial percentage of parents and business executives are disenchanted with higher education in general.

General consensus among CEOs and human resource managers in the study indicated that they are interested in three clusters of skills, namely cognitive, presentational and social. Cognitive skills include "problem solving," "critical thinking" and "learning to learn." Presentational skills include written and oral communication skills, and social skills enhance the ability of the individual to work cooperatively with other people (Hersh analysis, 1999). There are certainly no surprises in the set of skills deemed desirable. These skills are typically considered to be part of a liberal arts education, but they are also viewed as very important career skills. Our job as educators is to effectively develop and integrate these skills.

Hersh (Analysis) reports that many liberal arts institutions are beginning the change process. Included among popular initiatives being undertaken are an emphasis on business internships, international education, higher writing and speaking standards, and computer literacy. Other considerations encouraged by business executives and parents include greater emphasis on strong work habits, better development of independent and critical thinking skills, and seminars on how the business world operates.

SUMMARY

"From the beginning of America, the founders were interested in integrating technical and liberal education. They saw both as essential equipments of free citizens" (Schramm, 1995). The day of the technical specialist who does not understand organizational behavior has passed. Likewise, the day of the well-educated generalist with only a degree in one of the liberal arts has passed. Today, and in the future, the person with the "well rounded" education is and will be very much in demand. The time has come for educators in the technical arena to work very closely with their colleagues in the liberal arts and vice-versa to produce programs of studies that allow the student to optimize his/her educational experience. The time is right to consider a new paradigm in higher education. In order to solicit feedback to guide in this process, it may be necessary to identify and engage the various stakeholders in the educational process. Suggested stakeholders include but are not limited to students, parents, alumni, employers, and advisory boards. Higher education units can no longer afford to operate in an independent vacuum. The quality of our human capital and the competitiveness of our nation are at stake.

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Using Email as an Official Means of Communication

Marian M. Ritland
Computing & Networking Services
University of Wisconsin-Eau Claire
105 Garfield Ave
Eau Claire WI 54702-4004
(715) 836-4518
ritlanmm@uwec.edu

Introduction

At UW-Eau Claire email is a utility. We rely on it like we rely on heat, water and electricity. Instructors use it to communicate with their students and advisees, administrators use to communicate with faculty, employees use it to communicate with each other, and students use it to communicate with everyone. UW-Eau Claire is not unique in this use of email, but we believe we have taken our use of email a step farther than most. We have taken advantage of this widespread email use and now use it to distribute administrative reports, personal documents and official notifications saving money and improving service to students and faculty. We have been successful. In this paper I will tell you about UW-Eau Claire, our email services, distribution lists, and official use of email. I will discuss the savings and advantages of email as a delivery vehicle. I will also tell you how it has been accepted and share with you some precautions to take if you decide to also use email as an official means of communication.

The University of Wisconsin – Eau Claire

UW-Eau Claire is a four year, public, liberal arts university. We have about 10,500 students (9800 undergraduate and 700 graduate students) during the regular academic year and about 3000 during the summer. We have about 1,200 faculty, academic staff, classified staff, and limited term employees.

Hardware / Software Environment

UW-Eau Claire uses Control Data's Mail*Hub for our primary email server. This is a Unix based system. Starting this fall we will be switching over to Microsoft Exchange as our primary email server. We don't expect this switchover to have any significant affect on how we use email. We use a Unisys ClearPath NX mainframe for our administrative systems, almost all of which have been developed in-house. The mainframe uses a Unisys proprietary operating system called MCP/AS, which includes TCP/IP and contains a Windows NT server in the same box. Our desktop environment is primarily Windows NT. Our primary email client is Eudora, though many other email clients are also used. Our other servers (Web, DNS, Notes, Library, etc.) are primarily Windows NT or various flavors of Unix.

Email Services at UW-Eau Claire

Around 1985 we began providing email access to selected employees. The number of employees with email access increased significantly between 1985 and 1995. In 1995 we began providing email access to all employees and all students. This was the point when we began to view email services as a utility that students and staff should never be without.

Email Accounts at UW-Eau Claire

As soon as an employee is added to our personnel database and receives a current or future appointment he/she receives an email account. This is an overnight process. Students receive an email account after they are accepted and before they are scheduled to arrive on campus or when they first register, whichever happens first. This is also an overnight process.

Email use on campus is widespread. 90% of our students are active users of email; for undergraduates the figure is closer to 95%. 90% of our staff are also active users of email; most of the non-users are people who don't work at desks like custodians and maintenance workers, though we do have a few faculty who still refuse to use email.

We remove email accounts that have expired twice a year, around March and October. This allows students to retain access to their email accounts for several months after they graduate or stop attending UW-Eau Claire. Employees retain access to their email accounts until the March or October after they were last employed. Emeriti and other retirees, however, are allowed to retain their email accounts indefinitely.

We have taken many steps to encourage use of email. We provide free training on how to use email to students and staff. We provide staff members who do not have computers at their desks (or desks for that matter) access to computer kiosks for checking and sending email. More and more instructors are relying on email to communicate with their students. For many courses email use is required. The more email is used, the more people use email. The percentage of users of email has increased steadily. Use by students jumped quickly when they figured out that if they used email, they would get their registration appointments a few days or weeks earlier.

We collect email addresses from prospective students and alumni though we don't provide them with email accounts. This allows us to keep in contact with alumni via email, which is much less expensive than paper mail.

This universal access to email by all staff and students made email delivery of information possible and practical. Anyone who doesn't use email at UW-Eau Claire is not doing so by choice.

Class Distribution Lists

In 1995 when we first provided email accounts to all students we also began creating class distribution lists that contain all the students enrolled in a class along with the instructor(s) of the class. Any staff members may use these class distribution lists. Students may also use the distribution list for the classes in which they are enrolled. This allows these distribution lists to be used as pseudo "news groups", facilitating class discussions.

A primary use of these class distribution lists is in assisting instructors in building their gradebooks. We created a function called "gradebook" that allows a faculty member to request a list of the students in a class which can be pasted into a spreadsheet saving the instructor from entering the students manually. To use this function a faculty member sends and email to "gradebook" and places the name of the class distribution list in the subject line of the email message. They get back a list of the members of the distribution list along with the email name, student ID and classification of each person in the list.

The names of the class distribution lists are in the format 9999.xxxx.999.xxx where 9999 indicates the term, xxxx indicates the course department, 999 indicates the course number, and xxx indicates the course section. The name of the distribution list for section 001 of English 110 offered in the fall of 1998 is 9891.engl.110.001. In 1998 we began allowing additional people to be added to a list at the request of the instructor. An example of these are upper class student mentors assigned to freshmen experience classes that are not instructors and not officially taking the course.
Class distribution lists are re-built nightly for any class that has had drop/add activity that day. At first we didn't create distribution lists for a term until a few weeks before the start of the term. Now we create them as soon as registration begins for a term. This means that as soon as students register for a class we can begin communicating with them as a class.

Standard Distribution Lists

Soon after our introduction of campus-wide email we began receiving all kinds of requests to create distribution lists of one kind or another. The creation and maintenance of these lists we eating up the time of the technical people charged with administering our email system. We needed to come up with a way to reduce the number of these requests. We decided to increase the number and types of distribution lists that were created and maintained routinely. Below is a list of some of the standard lists we create along with examples and descriptions.

xxxx.majors - engl.majors - undergraduate students with an English major
xxxx.minors - engl.minors - undergraduate students with an English minor
xxxx.gradstu - engl.gradstu - graduate students in English
999999.program - students with the specific major or minor identified by the code 999999
xxxxxxxx.advisees - ritlanmm.advisees - students advised by the person with the email name ritlanmm
xxxx.staff - engl.staff - English department members (includes the secretary)
all.uwec.staff - all staff members at UW-Eau Claire (usage restricted)
contact.staff - designated contact staff person in each department
chancellors.staff - self explanatory
classified.staff - all permanent support staff members
lte.staff - all limited term employees
academic.chairs - academic department chairs
deans.list - deans, associate deans, assistant deans
supervisors.list - all support staff supervisors

Ad Hoc Distribution Lists

Creation of the standard distribution lists above was helpful in reducing the volume of requests, but there continued to be a significant number of requests for specialized lists. To deal with this problem we created tools and placed them in the hands of the Registrar and the Personnel office that allow them to create distribution lists for themselves and for others. Historically, these offices have responded to requests for mailing labels and reports using existing ad hoc reporting tools. We saw providing the capability to create distribution lists as a natural extension of the label production service. This has gotten our technical people almost completely out of the job of creating distribution lists.

Emailing from the Administrative Mainframe

In 1996 we acquired from GoldEye Software two pieces of software which allowed us to send email from our administrative mainframe. One piece of software allows us to send email messages directly from COBOL (or other language) programs. The other piece of software allows us to distribute mainframe reports as email attachments directly from our administrative mainframe. We realized right away that this might be a way to divert documents from print to email distribution and save time and money in the process.

We decided to make advisor grade reports our first test of this capability. Every semester we produced a printed grade report for each student. These grade reports were distributed to academic departments and then to individual advisors. We changed the advisor grade report program to allow either print or email distribution. We then sent an email to advisors inviting them to subscribe to the email version of the advisor grade report. The invitation contained a sample grade report. About 150 faculty members subscribed. We recorded the preferences of the faculty members who requested email distribution on the database. The distribution was very successful. In some cases we needed to provide some training on the use of email filters to assist advisors in managing these emails. We also discovered that if an advisor was using a proportional font as their default email font the grade report which was organized in columns did not look right. We added a warning at the beginning of the email advising them to chose "Courier New" as their font.

With the success of this project, we plunged ahead into replacing paper with email wherever practical. Since 1996 UW-Eau Claire has been emailing directly from our administrative mainframe many reports and documents that were formerly printed, separated by hand, addressed and stuffed into envelopes for distribution via campus mail services or stamped, sorted and mailed via the U.S. Postal Service. We've saved time, money, and paper and are providing faster, more accurate, and more flexible document delivery to our staff and students.

We send notifications on and off-campus telling persons that a file has just been FTP'ed or that a file is now available to be picked up. We also notify persons of the results of processing. We notifiy programmers about errors or problems needing attention. We send files as attachments or inserted in the body of the emails.

We accept grades from faculty via email, acknowledge receipt via email, apply the grades to the database and report the results of applying the grades including errors via email.

More and more paychecks are deposited electronically; however, the problem of distributing the earnings statements remains. UW-Eau Claire emails most earnings statements directly to staff and student employees.

Students request unofficial transcripts, degree audits and bills on-line. Faculty request unofficial transcripts and degree audits for their advisees on-line. These documents are delivered via email.

We will soon begin sending out grade reports and bills with a return receipt. Our plan is to mail paper versions of these documents only to students for whom we have not processed a return receipt.

Once a term we send an email to students with the current address information we have on file. The email contains a URL that will link them to the Registrar's address update page on the web.

We send students registrations appointment times to them via email along with a current degree audit.

We notify advisors when any of their advisees withdraw from school. We notify instructors when one of their students withdraws from a class after the initial drop/add period has ended. We notify instructors when students will be absent from class for illness or approved absences like field trips.

The mainframe reports that we now distribute via email are too numerous to list here. They include all kinds of reports; very short reports, very long reports, daily reports, reports that are viewed and discarded without every touching paper, reports that are permanently retained, all kinds of reports.

Student and Staff Acceptance

Students, as one would expect, have been very adaptable. They saw right away the benefits of receiving documents via email. They can make on-line requests for emailed documents such as transcripts, degree audits, and bills, saving them a trip to an office to pick up a paper copy. Many had difficulty opening attachments so, for the most part, we have sent them only emails with the information in the body of the message. Students have even been initiating some requests for email distribution. If any group of students was a bit reluctant, it was the graduate students who tend to be older and the least comfortable with email, at least on our campus.

Faculty have had mixed reactions. Some like it. Some don't. If they don't like it they really let us know. We have encouraged them to set-up filters to manage their email and have resisted making exceptions to standard email distributions. Some documents are only distributed via email. If they don't use email, they don't get it. For the most part they've been pretty positive and appreciative. They too have on-line access to request transcripts and degree audits for their advisees, which are delivered via email. They like this very much.

Support staff were a bit unsure at first. Once they started using it and saw how easy it was and how much it was like dealing with any other emails and attachments they became comfortable. They started to see the advantages as they worked with it. The speed of delivery as compared to the delivery time for paper reports really sold them. They could start their work at 8:00am instead of waiting for paper reports which often didn't reach them until 9:00am or the next day. If they were comfortable using a PC, their acceptance level was high. Once they started getting some documents via email they started asking if they could receive additional reports this way. Usually the answer was yes.

As you might expect, some of our programmers were the most difficult to sell on this. They had many legitimate concerns. As they experimented with it a bit with reports they knew they could recover, their appreciation grew. They had to learn a bit about SMTP and POP and how our email servers worked, but I think this was a plus.

Advantages

There are lots of advantages, many of which I have touched on previously. One of the most significant is the speed and accuracy of delivery. People don't need to wait for the reports to be sorted either by the computer center or the mailroom. People don't need to wait for the mail to come. People don't need to wait for the office secretary to distribute the reports. None of this waiting is necessary because the reports are emailed directly to the persons for whom they are ultimately intended, usually within minutes. Delivery is accurate; report distribution errors are reduced or eliminated.

One of the biggest benefits of receiving documents via email is all of the different things you can do with the emailed information once you get it. The power of the PC and its tools are available to use and manage the emailed reports as you wish. Reports are electronically searchable; instead of paging through long reports looking for a particular person or dollar amount, tools such as MS Word allow documents to be searched electronically. Reports may be printed all or in part. Reports are more "in-your-face" and are less easily misplaced or ignored. Reports may be moved to a shared directory to allow access by multiple people. Reports may be retained on a server. Reports may be burned to a CD. Reports may be forwarded to others for review. Multiple copies of a report can be viewed and scrolled at the same time on the same screen. Reports may be cut, copied and pasted into a another document or a spreadsheet.

Some reports that may not have been practical when distributed on paper may now be. Notifications to instructors when a student withdraws from a class or from the university was not something that was practical at UW-Eau Claire if done via paper, but was very practical and very appreciated when we began sending notifications via email. Reports may also be sent to multiple people, even dozens or hundreds of people, something that might not be affordable or practical with a printed version.

Savings

Less paper: We've saved lots and lots of paper. At least a 30% reduction so far. We have also saved all the consumables that go with printing (e.g. toner, envelopes and labels). The costs of printing are also pushed out to the users. They can decide whether something is worth printing and they bear the costs of printing. We don't have to convince them they don't really need some huge report. We can say yes without paying for printing.

Less microfiche: Once each term (4 times a year) we close out our student account receivables. This closing process generated several thousand pages of reports that used to go to microfiche and paper. Microfiche for retention and paper because they couldn't be without the information while they waited for the microfiche to be generated. Now we email the reports to a staff member in that office who moves them to a shared directory. No microfiche OR paper reports are created anymore as part of this process. Everyone in the office now has access to the report which is now electronically searchable.

Less postage: We haven't spent a lot of time measuring this, but we have definitely saved postage.

We will save even more as we begin to exploit return receipt and eliminate more and more mandated mailings. Return receipt and automated processing of the return receipt messages will allow us to use email for notifications required by law. One example is the notifications we are required to send to students when we apply their financial aid to their account to pay their student fees. We send out thousands of these every year.

Fewer, smaller printers: Because much printing is now diverted from the computer room and the large mainframe printers, we can buy fewer and smaller printers. We went from two 75 page per minute printers to two 40 page per minute printers attached to our mainframe. We are also less dependent on them because more of our reports can be distributed in other ways. Distributed printers have replaced some of this printing, but much of it has been eliminated altogether.

Less operator time: We run a lights-out computer room from 4:30pm until 6:00am. Not all of this is due to our diversion of printing to email, but we have reduced operator time as printing has decreased. We expect this to continue.

Fewer lost reports: We have lots of little reports that were easily lost and required lots of careful handling to be distributed properly. There have been significant savings here too.

Less distribution time: Payroll used to hire people to hand out paychecks and earnings statements. That burden is much reduced. The Registrar used to hire students to hand out printed degree audits for a full week each semester just before each registration period. That expense has been eliminated.

Improved Services

People have their reports when they get to work in the morning instead of waiting until 9am or so for our staff to sort and distribute them. Other reports that were distributed via campus mail used to take a day or more to reach the recipient. Not any more.

After leaving our office, reports destined for various departments might also need to be sorted and distributed by the department secretary. Now these reports can be sent directly to the person they are intended for bypassing the secretary and saving her time and more delay.

Reports that had some value but didn't justify the expense of printing can now be generated more often and more completely.

We can send students confirmations of schedule changes whenever one occurs, because we no longer have to pay postage. We can email it!

Precautions

Keep in mind the people who don't use email, either because they don't know how or because they don't want to. Retain alternative delivery for non-email users when feasible. Also use return receipt for documents that MUST be delivered. Know who is using email. We do this by reading the logs for people who are checking email and send a summary of this information back to our database for recording. This allows us to know before we send and email from our administrative mainframe whether someone is likely to read it. It helps us decide when and if we should send it another way.

(This is also how I know that our email usage is at 90%.) Sometimes the people who don't use email will surprise you.

Bring your email administrators and your programmers together. They will need each others' help to make this work. Get them comfortable with asking each other for assistance. Inform them of what each can do for the other. Often these people have different backgrounds. It might require bringing your mainframe COBOL programmers together with the PC/NT people who use Perl as their primary language.

Learn how email works. Learn something about SMTP and POP3.

Handle errors. If your SMTP server is down you must be able to recover and regenerate the messages. We have reduced this problem by creating a utility program that emails messages from a standard file format. Any programs that are not easily re-run build a file of email messages that is processed by the utility program. It has all necessary error handling, marks each message after a successful send, and is capable of re-sending any or all messages if necessary.

Make sure your email server and the servers that people keep their email on after they have retrieved it are able to hold the size and number of messages and reports you are sending.

Let your help desk know what's going on BEFORE you do a big mailing. Involve the help desk staff in the piloting of new applications if you can.

Try out different email clients and different fonts when reading the messages. What might look good in one font might look terrible in another.

Make sure undeliverable messages get sent to a real person. Don't let them vanish into cyberspace. Undeliverable messages can be a key to finding problems with your system and your assumptions earlier instead of later.

Use aliases and distribution lists for directing urgent messages to staff whenever possible so you don't need to re-direct messages whenever someone goes on vacation.

Teach recipients how to lock documents after they have received them using passwords or read-only directories to prevent changes, accidental or intentional, to documents meant for permanent retention.

Let your users warm up to it. Take it slowly. Don't force them. They'll see the benefits if you give them a bit of time.

Test! Test! Test! There's lots of power here. It's really easy to send thousands of messages to the wrong place if you're not careful. Some of this data is confidential; guard it carefully.

Conclusion

You can save money and improve services to your faculty and students by using email as an official means of communication. Plunge in and try it, the water's fine.

Managing the Updating of Computer Information Systems Departments at Small Colleges

Gary S. Rogers
Macon State College
100 College Station Drive
Macon, GA 31206-5144
(912)471-2809
grogers@cennet.mc.peachnet.edu

Statement of the Problem

The problem addressed is the nature of the difficulty that small colleges experience in keeping their computer information system departments current with the computer industry, thereby producing graduates whose skills may not be top-notch or in demand. This causes colleges, small and large, difficulty in allocating monies to ensure that appropriate funding is provided for all departments.

Background of the Problem

Keeping computer information system departments current at small colleges is a difficult task. One reason is that computer departments are relatively expensive to maintain. The needed infrastructure of personal computers, local area networks, varied software suites from operating systems to software development software to Internet software can be daunting in terms of dollars and cents. An extensive list of items is necessary since skills in the computer industry are rapidly changing to include newly-introduced technologies. An example is provided by the fact that only a decade or so ago, Cobol, Fortran and Pascal were the programming languages taught to computer information systems majors. The languages needed because of the demands of the computer industry marketplace are Cobol, "C", "C++", HTML, and Java.

Purpose Statement

The purpose of this study was to evaluate and identify the nature of the difficulty that these how small colleges experience in order to manage the process of keeping their computer information systems departments current.

The results of this research serve two purposes. First, the research provides a model for small colleges. Second, it identifies areas needing improvement.

Presentation

A Computer Department Course & Infrastructure Analysis Survey as attached, was sent to all the representatives. Responses were delivered via mail, in-person, telephone and/or electronic mail.

Correlating Survey Questions to Research Questions

A comparison of survey questions and research questions provides the following analysis in Table 2. This table indicates which survey questions provide data for the corresponding research questions this study investigates.

Table 2

Correlating Survey Questions to Research Questions

Research Question Number	Research Question	Survey Question Number	Survey Question
1.	What management software acquisition approaches are used by small colleges?	8	As a manager, where do you discover which software/ hardware/networking suites to purchase in order to manage the software infrastructure of your CIS Dept?
		11	Which of these two criteria (cost or quality) are most relevant in your software acquisition approaches?
2	What measures, if any, are performed by the representative colleges in order to keep their CIS curricula current with the reqt's demanded by employers in the computer industry?	3	What management techniques and information sources do you employ to assure that the offerings of your CIS dept are current?
		6	How would you rate the % of your graduates obtaining positions in the CIS field upon graduation?
		12	From which sources do you derive your CIS curriculum?
3	How often are these measures, if used, employed by the representative CIS departments?	7	How often do you re-evaluate your course offerings to assure that it is current with computer industry demands?
4	How difficult is it for small colleges	4	How difficult is it to

	to keep their CIS departments current?		manage your CIS dept to keep it current with technology?
5	From which sources do small colleges derive their computer-related curriculum requirements?	12	From which sources do you derive your CIS curriculum?
6	What kinds of difficulties do small colleges experience in producing job-ready graduates?	5	What are the constraints on your ability to keep the offerings of your CIS Dept current?
		10.	Would you say that your costs for providing the necessary infrastructure to train CIS graduates are increasing, decreasing, or remaining stable?
7.	Why do small colleges feel that it is important to provide their CIS graduates with skills appropriate to what is currently in demand in the computer industry?	2	Why do you feel that it is important for you to provide your CIS graduates with skills appropriate to what is currently in demand in the computer industry?
8.	How important do CIS managers dept managers feel it is to manage their CIS depts so that they provide their CIS graduates with skills appropriate to what is currently in demand in the computer industry?	1	How important do you feel it is to manage your CIS dept so that you provide your CIS graduates with skills appropriate to what is currently in demand in the computer industry?
9.	What hardware and software have the CIS depts purchased within the last year in order to provide an infrastructure conducive to providing CIS graduates with job-ready skills?	9	Please circle the category of sw and hw the CIS department has purchased in the last school year.
		13.	Please indicate which courses you offer to your CIS students.

Results

A careful analysis of the data gathered from the surveys provides the following information. This information was computed via Microsoft Excel, an electronic spreadsheet software package.

Research Question 1

What software acquisition approaches are used by small colleges?

Survey Question 8 addressed this research question. This survey question addressed the issue of how the Computer information systems departments discovered which software/hardware/networking suites to purchase last year in order to manage the software infrastructure of their Computer information systems Departments. Overwhelmingly, the data showed use of the Internet as shown in Table 3. It should be noted that the Total of all Responses represents the total of all responses for this question. Each participant was asked to rank these four criteria, with a "1" being the highest, while "4" was lowest. The minimum total for any criterion is 28 (a "1" per each participant x 28 participants). Therefore, a total of 28 would indicate that all colleges reported that criterion as the preeminent one. The Number of Responses Ranked Number 1 indicates the number of participants who selected that criterion as the preeminent one. As an example, the use of the Internet was selected as the preeminent criterion by slightly less than one-half of the participants (13 Of 28).

Table 3

Where to Purchase

Criterion	Rank	Total of All Responses	Number of #1's
via the Internet	1	30	13
via computer industry reps	2	42	15
via company mailings	3	46	14
via discussions with sales reps	4	48	0

In addition to Survey Question 8, Question addressed this issue as well. This question addressed whether cost or quality were the predominant consideration in the software acquisition approach by the surveyed institutions. The results are in Table 4. Note: Percent of Total indicates the percentage of the total number of subjects who selected that criterion. As an example, the data show that approximately 21% of all subjects (6 subjects out of 28 total) selected cost as their primary consideration when making software acquisitions, whereas the rest evenly split on the other criterion. Number of Number 1 indicates the number of participants who selected that criterion as the preeminent one.

Table 4

Cost and Quality Criteria in Software Acquisition

Criteria	Percent of Total	Number of Responses Num 1
quality then cost	39.29	11
both same priority	39.29	11
cost then quality	21.43	6

Research Question 2

What measures, if any, are performed by the representative colleges in order to keep their computer information systems curricula current with the requirements demanded by employers in the computer industry?

Three survey questions provided data to support this research question. The first was Survey Question 3. The management techniques and information sources employed by these CIS Departments in assuring that their course offerings are current were many. The *use of magazines* was the top-ranked criteria, followed *by attendance at conferences* and *use of newspapers.* Table 5 contains this data.

It should be noted in ranking all these criteria, the criterion were ranked in order of preference as being the most important criterion employed by these CIS departments in assuring that their course offerings are current. Number # 1 indicates the number of participants who selected that criterion as preeminent.

Table 5

Sources Used to Assure CIS Courses are Current

Rank	Criteria	Number # 1
1.	Use of industry magazines	20
2.	Attending Conferences	8
3.	Use of newspapers	6
4.	Guidance from professional societies	5
5.	Contacting industry department mgrs	12
6.	Contacting graduates	10
7.	Contacting corporate recruiters	5
8.	Contacting government organizations	0
9.	Guidance from other CIS Dept mgrs	4
10.	Reading books on the industry	4

The second was survey question 6. Assuming a correlation between students gaining employment in the CIS industry and up-to-date curricula, it therefore provides support for Research Question 2.

The data indicated that an overwhelming number of the institutions reported their students gained employment in the computer industry after graduation as follows in the following Table, Table 6. This table indicates, for example, that over 78% of the subjects reported an in-field placement rate of between 76-100% for their CIS graduates.

Table 6

In-field Employment Rates for CIS Graduates

Criteria	Number of Responses	Percentage
76 - 100 %	22	78.57
51 - 75 %	6	21.43
26 - 50 %	0	0.00
0 - 25 %	0	0.00

The third was survey question 12. This question researched the issue of which sources the subjects use to develop their curriculum. The results are found in Table 9.

Research Question 3

How often are the measures used by small colleges to keep their curricula current employed by the representative small colleges?

Survey question 7 addresses this research question. This question explored how often the Computer information systems Departments re-evaluate their curriculum to assure that it is current with computer industry demands. Responses varied widely, as can be seen by the following data in Table 7. It should be noted that this table indicates that more institutions (43%) evaluate their CIS curriculum once every two years than any other time.

Table 7

Curriculum Evaluation Periods

Criteria	Number of Responses	Percentage
Twice a year	4	14.29
Once a year	10	35.71
Once every 2 years	12	42.86
Over 2 years	2	7.14

Research Question 4

How difficult is it for small colleges to keep their CIS departments current?

Survey Question 4, "How difficult is it for you to manage your CIS Department to keep it current with technology?", addresses this issue.

In the issue of how difficult is it for Computer information systems Departments to manage their departments to keep them current with technology, the subjects felt it is a difficult endeavor. The following table, Table 8, provides this data. Please note that the scale was 1 to 5, with a score of 1 representing it not being very difficult for the CIS departments to manage their departments to keep them current with technology, whereas a 5 indicated it is an extremely difficult endeavor.

Table 8

How Difficult Is This Effort for CIS Departments?

Mean:	3.67
Mode:	4
Standard deviation:	0.87

Research Question 5

From which sources do small colleges derive their computer-related curriculum requirements?

Survey question 12 addressed this research question. This question researched the issue of which sources the subjects use to develop their curriculum. The results are found in Table 9. Please note that the Total of All Responses represents the total of all 28 participants who selected the various criteria. The subjects were asked to rank these criteria from 1 to 9. Therefore, a maximum sum is 28. This would indicate that all 28 subjects selected that criterion as the predominant one. A sum of 252 would indicate that ALL subjects ranked that criterion as last in importance. Number of Times Top 50% indicates the number of participants who selected that criteria in the top 50% of the field. For example, the number of times the participants selected a criterion as a 1,2,3 or 4. Number of Times as Number 1 indicates the number of participants who selected that criterion as number 1 (out of 1 to 9).

Table 9

Sources Used to Find Information to develop the CIS Curriculum

Source	Total of All Responses	Rank	Num of Top 50%	Num Times as Num 1
use ACM/IEEE data	43	1	27	18
contact industry reps	46	2	10	4
use industry magazine data	58	3	15	2
newspapers	64	4	2	0

contact CIS college depts	73	5	21	6
contact govt organizations	70	6	0	0
data from conferences	76	7	12	6
contact corporate recruiters	78	8	4	0
contact graduates	82	9	10	0

Research Question 6

What kinds of difficulties do small colleges face in producing graduates with market-ready skills?

Two survey questions support this research question. First, is survey question 5. In the area of constraints on the ability of the Computer information systems Departments to keep the offerings of their CIS department current, the following adequately describe the responses by the participants in Table 10.

Table 10

CIS Dept Constraints

Rank	Criteria	number of times this selected as number 1	percent num times as number 1
1	Budgetary constraints	18	64.3
2	Techno-skill	6	21.4
3	Industry moving too fast	9	32.1
4	Bureaucratic	3	10.7

The second survey question was 10. The results are shown in the following table, Table 11. Please note that the scale was a 1 to 5, the 1 representing that costs in providing an environment where their CIS graduates can receive job-ready skills for the computer industry are decreasing dramatically while 5 represented costs increasing dramatically.

Table 11

Costs for Providing a CIS Program Infrastructure

Mean:	4
Median:	4
Standard Deviation:	.08

Research Question 7

Why do small colleges feel that it is important to provide their Computer information systems graduates with skills appropriate to what is currently in demand in the computer industry?

Survey question 2 addresses this research question. Please note that the Percent of subjects indicates the percentage who indicated that a specific criterion is the most important criterion in *why* it is important to provide a relevant CIS Program. Also, Number of Times Selected indicates the number of participants who selected that criterion.

Table 12

Why Is It Important to Provide a Relevant CIS Program?

Criteria	Percent of Subjects	Number Times Selected
Getting Jobs	71.42	20
What Students Want	14.28	4
What Industry Wants	7.14	2
What Both Students & Industry Want	7.14	2

Research Question 8

How important do Computer information system managers feel it is to manage their Computer information system Departments so that they provide their Computer information system graduates with skills appropriate to what is currently in demand in the computer industry?

This research question was addressed by survey question 1. Table 13 shows these data. Please note that the scale was 1 to 5 (1 being very important and 5 representing not at all). Also, 20 out of the 28 total responses was a 1, for a percentage of 71.42%. Namely, an overwhelming 71% of the participants felt it is very important to produce market-ready graduates.

Table 13

How Important Is It to Produce Market-Ready CIS Graduates?

Mean of all Subjects:	1.3
Median of all Subjects:	1
Standard Deviation:	.06

Research Question 9

What hardware and software have the Computer information system Departments purchased within the last year in order to provide an infrastructure conducive to providing Computer information system graduates with job-ready skills?

Two survey questions addressed this research question. The first was survey question 9. Question 9 investigated the category of software/hardware, etc, the Computer information systems Departments purchased in the last school year in order to provide a learning environment for their students. This data is shown in Table 14. Please note that the Number of Responses indicates the number of participants who purchased that item last school year. As an example, 35.7% of the participants reported purchasing a "C" compiler within the past school year. Table 15 is also relevant to this research question. It provides information regarding how many subjects acquired what software. Please note that a response rate of 100 indicates this item being purchased by 100% of the participants.

As an example, the data shows that almost all of the participants, 89%, purchased a "C++" compiler last school year. Finally, Table 16 shows data in support of this research question. Table 16 investigated the number of personal computers the surveyed institutions purchased within the last year. Please note the Percent of Total represents the percentage of participants who purchased that specific number of PCs. As an example, 50% of the participants purchased from 1-10 PCs this last year. Note: 100% was not reached as not all participants completed this question.

Table 14

Category of software/hardware, etc the CIS Department has Purchased in the last school year

Item	Number of Responses	Percent of Total
"C"	10	35.7
"C++"	23	82.1
Java	14	50.0
Visual Basic	16	57.1
Software access	6	21.4
Sys anal tools	8	28.6
Internet dev tools	11	39.3
Data mgt tools	7	25.0
LAN software	8	28.6
LAN hardware	8	28.6

Table 15

Software Purchased: How Many?

Item	Response Rate (in percent)
"C"	37
"C++"	89
Java	52
Visual Basic	59
Software access	22
Sys anal tools	30
Internet dev	41
Data mgt tools	26
LAN software	30
LAN hardware	30

Table 16

Number of PCs Purchased within Last Year

Category of Purchase	Number of Responses	Percent of Total
1-10 PCs	14	50.00
11-25 PCs	1	3.57
26-50 PCs	7	25.00
51-75 PCs	0	0.00
76-100 PCs	3	10.71

Survey question 13 was the second survey question providing data in support of Research Question 9. The table, Table 17, as attached, provides the answers to this question provided by the participants.

This table basically lists what courses the participants include in their CIS curricula. It lists which courses are offered as electives, and/or major courses, or not even offered at all. As an example, it indicates that Pascal Programming is offered by only 4 of the participants as an elective course, 2 as a minor course and 22 do not even offer this course at all. Compare this to a currently popular course, Object-oriented Programming. This course is offered by 6 of the participants as an elective, 20 offer it as a major course and only 2 do not offer this course at all in their CIS curricula.

Summary, Conclusions and Recommendations

Summary

The purpose of this study was to evaluate and identify management practices used by small colleges in North Carolina, South Carolina and Virginia to keep their CIS departments current. It is important to note that this study provides important data in the area of how small colleges in several Southern states are progressing in the ever-present need to provide a learning environment for the students in their Computer information systems departments. It also points to the reasons why these institutions are struggling in this area.

Several research questions were addressed via this study, then analyzed and the results reported.

Conclusions

All research questions were addressed in this study. Answers were gathered via the returned surveys and then the data from those surveys presented.
In answer to research question 1 addressing the area of software acquisition, it can be argued from analysis of the data that, even though there is concern whether small colleges have the requisite financial resources available, quality and cost are deemed similarly important. Several subjects, via telephone, indicated that "you pay for what you get" in the area of purchasing software from the vendor community.

Research question 2 centered around the important issue of curricula, namely keeping it current. This management of curriculum is obviously an important management process. However, which *sources* do computer information systems departments use to develop this curriculum? The data pointed overwhelmingly to the use of industry associations such as the American Computing Machinery(ACM) and Institute of Electrical Engineers(IEEE). This indicates the importance with which the educational community places upon industry associations and industry itself. Upon discussions with subjects, it was discovered that several felt that these associations possess a keen sense for appropriate curricula. The reason cited was the fact that these associations are extremely active in contacting both industry and educational representatives.

In addition, it can be argued that computer information systems departments also utilize industry sources such as industry representatives and relevant industry magazines extensively.

Perhaps remarkably, these computer information systems departments did not report the use of advice from other computer information systems departments as much of a factor in deciding which courses to offer. One subject mentioned this is because she felt that other computer information systems departments did not know any more regarding this area than she did. Instead, as mentioned before, advice from industry was eagerly sought.

On a positive note, employers must feel these curricula produce graduates with relevant skills in that an overwhelmingly percentage (78.57%) of the subjects reported that 75-100 percent of their students gained employment in the computer industry after graduation. The next highest was 50-75 percent. Remarkably, no institutions reported relatively little (less than 50%) employment in the computer field of students after graduation. This may be an interesting fact in that computer information systems departments are admittedly concerned about providing an environment where their students can gain fruitful skills, and yet these students do actually report respectable rates of employment in their chosen field. This indicates that the small colleges are successfully training their students, regardless of their concerns.

Research question 3 deals with the interval in which these computer information systems departments evaluate their computer information systems curriculum. It is clear from the data that there is widespread disagreement on how often to evaluate your curriculum. One subject mentioned that it was simply a lack of time, namely there just is not enough time to re-evaluate the curriculum as often as they hoped, whereas another subject indicated they felt that it was absolutely critical to re-evaluate twice a year, so time was made, regardless of the workload.

In the issue of how difficult it is for computer information systems departments to manage their departments to keep them current with technology, research question 4, the subjects felt it was a difficult endeavor (the mode was 4 on a 1 to 5 scale). In fact, the standard deviation was only 0.87, indicating a consensus on this issue.

In the area of how the computer information systems Departments discovered which software/hardware/networking suites to purchase last year in order to manage the software infrastructure of their computer information systems departments, the subjects overwhelmingly selected the use of the Internet as their primary method (85.71%). This may be looked at as simply another indication of the increasing importance placed upon the Internet by the educational segment. Upon telephone conversations with several subjects, it was frequently mentioned that they considered corporate information on the Internet to be just as valid as sales literature, and even more so when issues of projected upcoming events was considered. In short, they felt that the Internet was an excellent resource in which to discern upcoming major events in the computer industry such as new product releases and real, versus advertised, performance of products. An instance was that of Windows 98. Several subjects felt they gathered excellent information via the Internet on Windows 98 features and deficiencies prior to product release. As one subject noted, the Microsoft Internet site (www.microsoft.com) provided excellent information on the features of the upcoming Windows 98 product, but other sites provided excellent analysis on whether these advertised features really worked and whether they were central to the operation of the Windows operating system or mere appearance add-ons.

Another instance was the emergence of Linux, a possible viable alternative to Windows 98 as a desktop operating system. Several subjects mentioned that extensive information regarding this new product was, and is being, obtained via Internet sources. Three subjects mentioned the primary Linux web site, http://www.redhat.com. One mentioned that without the Internet, their computer information systems department would be *mired in the past.*

Research question 7 addressed the issue of why computer information systems departments feel it is important to provide industry with graduates possessing job-ready skills. The reasons stated by these computer information systems departments were fairly consistent. As can be seen by the data reported, the most common reason given was getting jobs. Therefore, it can be surmised that these computer information systems departments sense the keen desire of students to have valuable skills upon graduation.

Regarding research question 8, it also can be concluded from the results of the survey that computer information systems departments consider it extremely important to manage their computer information systems departments so that they provide their computer information system graduates with skills appropriate to what is currently in demand in the computer industry. Two subjects mentioned that it was so important they were supplementing their department budgets with their own personal funds to assure graduates receive job-ready skills.

Research question 9 addressed the issue of discovering what hardware and software the computer information systems departments have purchased in order to provide a productive infrastructure for their students. Tables 14, 15 and 16 provide data into this issue. These tables indicate that acquisition activities are transpiring. Several subjects, however, felt that simply not enough was being purchased due to budgetary constraints. Table 17 provides data into what courses are being offered, using this purchased infrastructure.

These results do not bode well for the future of computer information systems programs at small schools. If prospective Computer information systems students expect a level of infrastructure and matching curricula that small colleges cannot provide, then it is likely these students will enroll in colleges where the financial resources are available to provide this environment. Will it become an environment where only more financially-secure, perhaps larger, colleges can afford these types of programs and therefore leaving small colleges the tasks of training our future leaders only in the arts and humanities?

Recommendations

From analysis of the results of this study, it is clear that small institutions must be proactive in locating additional, and perhaps alternative, means of financing their Computer information systems instructional programs, and the requisite infrastructure, so students can continue to be provided with a learning environment so industry can obtain graduates with relevant job skills in this expanding IT workplace. Means such as grant-writing activities, pursuing wealthy alumni, and closer collaboration between industry and these small schools may be ways to alleviate this problem for the small schools.

Another alternative would be to leave these costly programs such as Computer information systems to perhaps larger more financially-secure colleges. This would allow small colleges to concentrate their sometimes scant resources in the areas of the arts and humanities.

In addition, this study reinforces the idea that more in-depth study is necessary in order to develop a clearer picture of the dilemma of small colleges as they attempt to stay current so their Computer information systems graduates are possessed of job-ready skills. Otherwise, the computer industry may only search for graduates from the larger, well-supported schools.

Social Impact of the Study

Higher education is a societal institution enveloped in change processes. "More than any time in our history, higher education is at a crossroads. The forces that impinge on it come from nearly every point on the circle, and, whether the higher education community sees it or not, change will occur" (Sullivan, 1997, p. 143): This study should further enhance the view that our educational institutions are in a time of turbulent change, one in which students, faculty and administrators alike must work closely together. It is clear that the public "wants enough workers for each industry, and it wants them well-trained" " (Sullivan, 1997, p. 144). It should be readily apparent that our educational institutions owe the student population much in the way of imparting knowledge and market-ready job skills. This is especially crucial in that one of the changedrivers about the future concerns the aspect of America becoming an information-based economy (Komives & Petersen, 1997). Small institutions such as the ones studied via this report are no exception. Even with the enormous financial strains evident today, it is clear they must continue to creatively find the resources, financial and instructional, to provide a learning environment for their CIS students. Students, parents, legislators and donors all want graduates prepared for the jobs available (Sullivan, 1997, p. 145). Do we as a society really want our graduates to come from a select group of colleges (for example, only those "well-heeled") or is it not better to have graduates from a diverse group of colleges, large and small, public and private?

Institutions, large and small alike, owe it to society to provide a learned cadre for the workplace and society alike. It is expected this study will contribute to this process by expanding the knowledge base in this arena as well as surfacing increased discussion of these issues.

References

Komives, S. & Petersen, R. (1997). Values & Principles Guiding Technology Decision Making for the Future, New Directions for Student Services, n78, Summer 1997.

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Table 17

Course Offerings

Number of Times Courses Listed in Curricula

CIS Course	Elective	% of total	Minor	%of total	Major	%of total	Not Offered	% of total
Pascal programming	4	14.3	2	7.1	0	0	22	78.6
"C" programming	4	14.3	2	7.1	14	50	8	28.6
Object-oriented programming	6	21.4	0	0	20	71.4	2	7.1
COBOL programming	4	14.3	0	0	16	57.1	8	28.6
QBASIC programming	2	7.1	0	0	10	35.7	16	57.1
4GL programming	2	7.1	0	0	4	14.3	22	78.6
Data structures	2	7.1	2	7.1	6	21.4	18	64.3
Visual Basic Programming	10	35.7	0	0	10	35.7	8	28.6
JAVA programming	18	64.3	0	0	4	14.3	6	21.4
HTML programming	8	28.6	0	0	8	28.6	12	42.86
Sys Analysis & Design	2	7.1	0	0	22	78.6	4	14.3
Computer networking	8	28.6	0	0	16	57.1	4	14.3
DBMS	2	7.1	0	0	22	78.6	4	14.3
Decision support systems	4	14.3	0	0	8	28.6	16	57.1
Project management	2	7.1	0	0	10	35.7	16	57.1

Computer Department Course & Infrastructure Analysis Survey

Name: ______________________________

Please answer the following questions and rate your answers utilizing the following scale.

1. *How important* do you feel it is to manage your CIS Department so that you provide your

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Computer Information System(CIS) graduates with skills appropriate to what is currently in demand in the computer industry?

1	2	3	4	5
Very important	important	somewhat	Not much	Not at all

2. *Why* do you feel that it is important to provide your Computer Information System(CIS) graduates with skills appropriate to what is currently in demand in the computer industry?

3. What information sources do you employ to assure that the offerings of your CIS Department are current? (Please place a priority to each appropriate item...1 being the highest priority)

___use magazines to keep abreast of marketplace
___contact CIS Department Managers in the computer industry
___use newspapers to keep abreast of marketplace
___contact CIS departments at other colleges
___go to conferences to keep abreast of marketplace
___contact students already graduated from your CIS curriculum
___contact corporate recruiters
___read books on the evolving marketplace
___contact governmental organizations
___professional societies(ACM, IEEE,etc)
___Other: please list: __________________________

4. How difficult is it for you to manage your CIS Department to keep it current with technology?

1	2	3	4	5
not difficult	somewhat difficult	so-so	difficult	very difficult

5. Management of constraints can be a difficult management endeavor. What are the constraints on your ability to keep the offerings of your CIS Department current? (Please place a priority to each appropriate item...1 being the highest priority)

___budgetary constraints

___bureaucratic constraints

___techno-skill constraints

___industry is simply moving too fast

___Other: please list:

____________________________ __________________________

6. How would you rate the percentage of your CIS graduates obtaining positions in the CIS field upon graduation? (Please circle the appropriate selection)

75 - 100%   51 - 75%   26 - 50%   1-25%

7. How often do you re-evaluate your course offerings to assure that it is current with computer industry demands? (Circle the appropriate response)

longer than every two years   once every two years   once a year   twice a year

8. As a manager, where do you discover which software/hardware/networking suites to purchase in order to manage the software infrastructure of your CIS Department? (Please place a priority to each appropriate item...1 being the highest priority)

___via the Internet   ___via computer company representatives

___via company mailings   ___via discussions with company sales reps

___Other: ______________________

9. Please circle the category of software/hardware, etc you (the CIS Department) have purchased in the last school year. (Please circle as many as necessary).

Compilers: "C"   "C++"   Java   Visual Basic

software access and development tools   Systems analysis tools

Internet/WWW development tools   Data management tools

local area network software   Local area network hardware

workstations/PCs: 1-10   11-25   26-50   51-100   100+

Others: __________________________________

____

10. Would you say that your costs for providing the necessary infrastructure to train CIS students are increasing, decreasing or remaining stable?

decreasing................decreasing..............stable.................increasing..................increasing
dramatically   dramatically

11. Which of these two criteria are most relevant in your software acquisition approaches? (Please place a priority to each appropriate item...1 being the highest priority)

___cost then quality ___quality then cost ___both same priority

12. The management of curriculum is an important management decision. From which sources do you derive your CIS curriculum? (Please place a priority to each appropriate item...1 being the highest priority)

___use data from industry magazines

___contact representatives in the computer industry

___use data from established organizations such as ACM and/or IEEE or others

___newspapers to keep abreast of marketplace

___contact CIS Departments at other colleges

___data received via conferences

___contact students already graduated from your CIS Department

___contact corporate recruiters

___contact governmental organizations

13. Please circle the following courses you offer to your CIS students, and whether it is part of your major or an elective course. Also, please indicate whether you currently offer that course, or whether you plan to in the future.

"C" Programming	Major	Elective	Current	Planned
Object-oriented Programming	Major	Elective	Current	Planned
COBOL Programming	Major	Elective	Current	Planned
QBASIC Programming	Major	Elective	Current	Planned
Visual BASIC Programming	Major	Elective	Current	Planned
JAVA Programming	Major	Elective	Current	Planned
HTML Programming	Major	Elective	Current	Planned
Sys Analysis and Design	Major	Elective	Current	Planned
Computer Networking	Major	Elective	Current	Planned
Data Base Mgt Systems	Major	Elective	Current	Planned
Decision Support or Expert systems	Major	Elective	Current	Planned
Project Management	Major	Elective	Current	Planned

14. Additional comments you wish to make:

Cyberclass: Does it work?

Bruce Sanders
Librarian
(765) 658-4417
rsanders@depauw.edu
David Field
English Dept.
(765) 658-4686
dfield@depauw.edu
Bruce Serlin
Biological Sciences Dept.
(765) 658-4770
dance@depauw.edu
DePauw University
Greencastle, Indiana 46135

Abstract

The session will demonstrate an undergraduate seminar on consciousness in which the syllabus, the schedule, many readings, all essay assignments and their evaluations, out of class discussions, and a class project were done via the web. The pluses, the minuses and the pitfalls to avoid in constructing such a course will be discussed.

When the initial planning for this course began the prime motivation for using technology was to take advantage of the huge reservoir of consciousness related information available via the internet. However, this quickly evolved into the broader objective of seeing how we could use technology to facilitate learning in a class with a seminar format. It was decided that daily writing assignments would be posted and evaluated electronically, reserve readings would be made available electronically, and instead of a term paper a collaborative webpage project would be required.

The goals of the course were for the students:

1. to think about what consciousness is and become familiar with the problems associated with various conceptions of consciousness

2. to be exposed to the approaches taken and conclusions drawn by various disciplines and individuals with regards to studying consciousness

3. to assess the positions of the disciplines and the individuals they've been exposed to, and draw some conclusions of their own about the nature of consciousness

The methods of the course:

1. To provide interdisciplinary readings on the topic in paper and electronically (electronically refers to readings provided via electronic reserves and readings provided via links to articles on the web)

2. To discuss the readings in class, and to continue discussions outside class via a web-based forum

3. To force the students to engage the readings and the problem via writing assignments:
    a. daily summaries and critiques of the assigned readings
    b. a final project--in this case a collaborative web project

Implementation of the course:

The syllabus and a schedule of assignments which included actual links to readings on the web and to articles placed on electronic reserve were placed on a campus server. The software *Web Course in a Box (WCB)* was used to provide a place for students to post assignments and instructors to evaluate assignments, and it furnished the class with a threaded forum for discussion outside class. Access to writing assignments was restricted in such a way that the evaluation of the writings and any ensuing dialogue with the individual student would be limited to the instructors and that student. Student essays were then harvested so that the class had the opportunity to see what their fellow students were saying in their essays. Articles placed on electronic reserve, were located on *WCB* as well. Since *WCB* required a password to be accessed, the reserve articles were not available to the public, and thus, there were no worries about copyright violation. Workshops were provided early on for showing students how to construct webpages, how to search the internet and evaluate its content, and how to use *WCB*. Classes consisted of discussion of the readings in a seminar format with all the instructors present.

How the course went:

Early reading assignments were philosophical in nature and several of the initial classes involved workshops. Carol Smith, from our computing center, gave lectures on how to use WCB and access the syllabus and schedule, how to construct a webpage using the web site creation software *Frontpage*, and discussed webpage structure and aesthetics. History professor Dennis Trinkle gave a talk on how to search for and evaluate the quality of information on the web. In retrospect the workshops should have been held later in the semester, or even better, done outside class. Class time discussion was at a premium, and the workshops reduced the discussion time available. This was especially problematic in the early going when the class was struggling with concepts related to consciousness. We quickly realized that the students did not have enough background to effectively understand philosophical positions conveyed in the initial readings. Therefore, we moved a number of primary scientific readings up in the schedule. This had a very positive effect on the quality of discussion in class because the students began to understand issues raised, and to possess information on which to base opinions.

The daily writing assignments proved to be a good idea. It was clear the writing assignments were forcing the students to think about the readings. Some students did go overboard with very long summaries and criticisms of readings. The ability to rework their essays up to the moment of submission, or the realization that the other students in the class could read their work may have been the cause of this problem. We should have explicitly limited the length of the writing assignments. *WCB* allowed for quick and sometimes lengthy evaluations of a student's assignment, as well as continued discourse with the student. This was an extremely positive use of technology in the minds (brains?) of, at least, the instructors.

The public forum for discussion outside class initially generated a lot of comment, but this slowly died down as the semester progressed. The *WCB* public forum had its drawbacks. In particular, as the discussion got larger it became hard to tell new comments from old comments.

The web project for the class was treated like a collaborative term paper. The class was divided into four groups to deal with specific aspects of the problem of consciousness. There was a common theme (zombies) with which to tie the web page together. Each group was given a question to answer: What is it like to be a zombie?, How do you identify a zombie?, Are we all zombies?, Do zombies have culture?. "Zombie" is a jargon term in philosophy of mind for a hypothetical creature that does not have consciousness, but whose behavior is indistinguishable from conscious creatures. Each question dealt with a specific aspect of the problem of consciousness. We knew producing a web page in one semester would be a daunting project. Given the time constraints and the amount they had to learn; we thought the class did a remarkable job. The webpage takes up about 5 Mb of space on our server. There were no audio or video clips which would have taken up far more space on the server. This would not have posed a problem for us, but it is something that must be taken into consideration when assigning such a project. The web address for the class webpage is:

depauw.edu/projects/hs300b/course

Strengths and weaknesses of the course:

There were 16 students in the class. Even with three instructors, this was too large for a seminar format. There was simply not enough time for every student to contribute in class discussions. Twelve students would have been a much better number.

The students complained that the work load was too heavy, but they persevered in doing the work. One way to look at this is that they were challenged, and though they did not enjoy it they rose to the challenge. Having said this, there are ways we could have made things more efficient. We do not think the amount of reading should have been reduced, but we should have varied the daily assignments with some students summarizing the readings while others were answering specific questions and/or generating questions for the upcoming class. Possibly we could have staged some mini-debates in lieu of writing assignments. We also should have explicitly limited the length of the students' essays.

It was important that the web project have a theme to tie things together, but the zombie theme was probably too arcane. The students spent too much time struggling with the notion of a zombie. We should have made each group's topic more explicit (and with 12 students we should reduce it to three topics). Also, we should have had them working on the web project earlier with a preliminary completion date for content well before the end of the semester. This would have provided more time for constructive criticism and coordination between the groups. An even better solution would be to have the class work only on the content of the project, and build the actual web page in a subsequent winter term class. Some students complained about doing a group project. With 12 students it would be possible to assign twelve separate topics to then be coordinated in a later winter term class.

Because the schedule was on a server, it was very easy to change when necessary. Some students did not like this, as it interfered with their ability to read ahead. However, the changes in the schedule during the semester improved class comprehension markedly. We now know which readings worked, which didn't, how to improve the order of the readings, and the content. In particular, we believe we needed a few more thought provoking stories and fewer "clinical" readings. We should have made a resource set of auxiliary readings available to the students as well. We had hoped the students would find their own auxiliary resources (and they did to some extent as part of the process of working on their web pages), but an auxiliary set would have facilitated the process for them.

Many of the class readings were scanned into *WCB* and were available as electronic reserves by hyperlink from the schedule. Some students liked the convenience of electronic reserves, but many were nevertheless printing the articles off as hard copy because they did not like reading the articles on a computer screen. It was time consuming to scan in the articles. Illustrations were especially problematic, and the text had to be proofed. We are undecided as to whether or not electronic reserves are the way to go. Scanning should get easier, and eyestrain should be less of a problem as computer technology continues to improve. Student access to computers and comfort using them should improve as time goes on as well.

Posting writing assignments into *WCB* proved to be an excellent idea. It made for better feedback to the students (including dialogues), and allowed students to read each others' work. It was very time consuming for the instructors to provide lengthy feedback. Many of the students did not take the time to read each others' work, but some did take advantage of this feature and used others' writings as sources for initiating dialogue in the public forum. It was very time consuming for a student worker to make student postings available to everyone. A better way of doing that needs to be found.

The public forum function in *WCB* needs to be improved. As mentioned earlier, it was not easy to determine old comments from new comments in the forum, and as the dialogue grew this became more and more of a problem. Halfway through the semester we initiated a second forum. This temporarily relieved the problem. As dialogue diminished the instructors probably could have provided more of a leadership role in initiating discussion and encouraging use of the forum as well.

One of the biggest strengths of the course was the support we received from our computing center. The computing center support was underwritten by a Mellon grant (a description of the Mellon project may be found at http://depauw.edu/fits/mellproject.htm). The technology aspects of this class simply could not have been accomplished without that support. Carol Smith and student workers from our computing center were assigned to help us implement the course. Software decisions and the architecture of the implementation depended on Carol's expertise. She and her students set up the server pages and showed us how to use *WCB*. Discussions with Carol helped us decide who would have access to what, and how the forums in *WCB* would be used. Carol and her students were also available throughout the semester to help the groups design their webpages.

Conclusion:

How one conceives of consciousness affects one's personal world view. It was clear from our interactions with the students that the goals of the course were being met. That is, it was clear that they were being forced to grapple with the concept of consciousness--to question deeply held beliefs and to look for ways to reconcile those beliefs with the information the course was providing. The electronic components of the course were not necessary for this process to occur, but we believe it did greatly facilitate the process.

Starting a Curriculum with some National Science Foundation Monetary Help

Charles Smith
Computer Technology
Horry-Georgetown Technical College
P O Box 261966, Conway, SC 29528-6066
(843) 349-5265
smithc@hor.tec.sc.us

Introduction

Horry-Georgetown Technical College was awarded a National Science Foundation Grant to assist in the commencement of a Computer Networking curriculum. Funding assistance was the critical step to the startup of this new program for the college. However, help with the cost was just one of the steps needed for us to embark on a new Associate Degree path. As with starting any new curriculum, the College also had to deal with the questions of what to teach, when to teach, where to teach, how to best teach the subject matter, and finally who to teach. Before the questions above could even be formulated, the initial idea for the program had to occur. This paper describes how Horry-Georgetown Technical College got the idea and embarked upon the path to start a computer-networking program. The objective of this paper is to provide the seed to enable others to more easily start new curriculums and obtain help with funding.

National Science Foundation Funding

Obtaining funding assistance was not the first step in the whole process of starting a new degree program for us. It was however, the critical step that placed everything else in motion. Realistically, just the process of writing the grant proposal and obtaining administration support for it placed the new program in a position for accomplishment. Even had the College not been successful in the quest for a grant, I feel confident the startup of a computer-networking program would have continued but on a smaller scale and with a longer time to implementation and full accomplishment. The National Science Foundation monetary support placed the program start and achievement on a much faster track.

Many of you are already familiar with the National Science Foundation (NSF). Created by Congressional action in 1950, the NSF uses federal funding to further scientific progress in the United States. Basically the NSF provides funds to assist educational institutions and other organizations in furthering the science of the nation.

Within the NSF are several administrative offices (Director, etc.) and seven Directorates. Each of these Directorates is responsible for varying numbers of specific areas normally called Divisions. As an example, the Computer and Information Science and Engineering Directorate has six divisions while the Biological Science Directorate has eight divisions. Broken down within a Division are programs that provide for funding assistance. Each of the Directorates has individual goals and requirements pertaining to their areas. Funding is normally applied for and granted within a specific program that is administered by a Division that is contained within a Directorate.

Many times the NSF is thought of as supporting only those activities that are pure scientific and engineering research. That was my impression of the NSF before being involved with our grant. While the NSF does provide a large amount of funding for research it also supports many other peripheral services that contribute to the advancement of science throughout the country.

The Education and Human Resources Directorate provides the prime example of funding for functions that support the sciences without necessarily being pure research. Education and Human Resources (EHR) provides assistance to better the education of science majors as would be expected. This Directorate also provides funding for K-12 and the undergraduate level to improve education of students in science, math, and technology. The Division of Undergraduate Education within the EHR Directorate awarded Horry-Georgetown Technical College's grant. The individual program area was Instrumentation and Laboratory Improvement. The grant is for the purchase of hardware and software enabling the college to equip a computer-networking teaching laboratory. Teaching computer-networking technology at a two-year institution would hardly qualify as a ground breaking research project. It does however, fill a critical need for the job market and prepares students to proceed further in their education.

To illustrate the wide varieties of funding opportunities and to reinforce the fact that you do not have to be a science educator in order to take advantage of NSF monetary support, we will look briefly at the EHR Directorate. This particular Directorate contains divisions providing an array of programs not just for the science researcher but for others as well. The other Directorates also provide an equally wide assortment of opportunities.

The EHR Directorate contains the following seven divisions: Educational System Reform (ESR); Elementary, Secondary, and Informal Education (ESIE); Undergraduate Education (DUE); Graduate Education (DGE); Human Resource Development (HRD); Research, Evaluation, and Communication (REC); and Experimental Program to Stimulate Competitive Research (EPSCoR). As mentioned before, each division contains individual program areas that provide assistance in specific areas. Also each Directorate participates in some programs that are NSF wide.

The Educational System Reform division has three main areas: Statewide Systemic Initiatives, Urban Systemic Initiatives, and Rural Systemic Initiatives. Most of the ESR division's efforts are directed towards wide area educational system projects that better the education available to students. Collaborative efforts are highlighted and fostered in this area. Closely aligned is the Elementary, Secondary, and Informal Education division that provides for programs as indicated by the division name.

Undergraduate Education consists of programs contained within Advanced Technological Education; Course, Curriculum, and Laboratory Improvement; and NSF Collaboratives for Excellence in Teacher Preparation. These areas run from improvements in the education of science and engineering technicians to educator preparation to funding to improve equipment in classrooms.

Graduate Education has programs and activities such as Graduate Research Fellowships; Integrative Graduate Education and Research Training; NSF-NATO Postdoctoral Fellowships in Science and Engineering; Travel Grants for NATO Advanced Study Institutes; and NSF Postdoctoral Fellowships in Science, Mathematics, Engineering, and Technology Education. The Graduate

Education division programs sound more traditional, but they still deal with education and not necessarily new research.

The Human Resource Development division has programs for Minorities; Women and Girls; and Persons with Disabilities. The division seeks to help remedy the under-representation of certain groups of citizens in the areas of science, mathematics, engineering, and technology.

I think the information above provides enough to convince you that there are many opportunities for funding assistance from the NSF that do not involve pure scientific research. I strongly encourage you to visit the Internet home page of the NSF (nsf.gov) and specifically the EHR home page (ehr.nsf.gov) where all the details of the generalities provided above can be found.

The NSF offers many of its publications on line at its Internet site. The site provides for downloading most of the publications in more than one format. Particularly useful is the current fiscal year Guide to Programs. This publication delineates each of the Directorates and accompanying programs in detail, including contact addresses for each area of NSF support.

There is also a publication called Grant Proposal Guide. This covers the specific requirements of filling out the forms used to apply for a grant, i.e. writing the grant proposal. As you write the proposal keep in mind that each specific program area may have particular requirements promulgated in its most recent individual Program Announcement, another publication available electronically. There are two types of proposals called Unsolicited and Solicited. Unsolicited is the normal proposal generated from the program announcements. Solicited proposals are requested by an issuance of a specific solicitation.

In our individual grant proposal we had to use a different budget format from the one specified in the Grant Proposal Guide. Do not be discouraged by special forms or requirements. The budget format specified by the particular area we applied for was easier to work with than the standard budget format. The unique requirements are sometimes less arduous than the standard ones.

The NSF also has several search databases at its Internet site. One will allow you to view the percentages of grant proposals submitted compared to the number approved. Included in the same search instrument is the ability to filter the results by inclusive years or state. You can see how your state is doing in the quest for the federal dollar as compared to others. This page also gives the average decision time, the average life of the grant, and the average amount of NSF money involved per year. This is set up as a drill down search where you start wide area with the NSF as a whole and then can go down into individual Directorates and so forth.

Electronically, the NSF provides a wealth of information for our use. I encourage you to take some time at their site and just look around. Under one area, called Grants, you can see some very specific information about the grants that have been funded. Of particular interest is the text of abstracts for each grant. What idea havens to just cruise through and see what some of your contemporaries are doing. Previous grants will be covered further under discussions of obtaining the initial idea.

Identifying the Idea

Where does the idea for starting a new curriculum program come from? As with any new education program, there should first be a need. One of the worst things a school can do is to graduate a student with skills that are not needed. To do so is wasteful of precious education resources, not to mention the negative impact on the student.

Our idea came from a combination of two places: First, was what other colleges were doing and second, from tracking our graduated students. Through follow-up surveys and just plain old keeping in touch with our graduates, we learned that many were not actually doing computer programming. Some of our graduates were hired because of their Associate of Science in Computer Technology, however they were actually performing functions in the computer field other than what would be considered traditional programming. This caused us some concern as our degree path was a traditional programming oriented curriculum.

Our department makes efforts to stay in touch with our counterparts at other South Carolina technical colleges. Sometimes we are offered opportunities to meet our counterparts at different functions during the year. Because of these meetings we were aware that a few of the colleges had changed their Computer Technology AS major to include some emphasis other than programming.

When we started talking about some new curriculum directions the program could take, we found that our Advisory Committee re-enforced our need for change. The Advisory Committee, made up of local computer industry professionals, identified the need for a curriculum that offered computer students options other than just programming as a major emphasis. This clearly punctuated our need to change.

Knowing that a few of the other colleges had implemented some changes, we investigated the details of the changes and talked with our state organization. Within the state organization requirements we were able to combine some of the best parts of what a few other colleges had previously implemented. The result is an AS degree in Computer Technology with one of three separate career paths or emphasis: Programming, Applications, and Networking. The first two semesters are identical for each path. During the third semester our students choose the direction they will take.

Staying in communication with our counterparts allowed us the opportunity to know the types of initiatives they were undertaking. Just as importantly we also knew how those initiatives were developing. This enabled an objective evaluation of the success, or lack thereof, of what had been done previously by our counterparts. Because of this knowledge, the addition of a new curriculum and the process of how to incorporate the new with the old was much easier and we think will be more successful.

There are many other ways to identify ideas for new or modified programs. One I strongly encourage is again dealing with the NSF. On their Internet site is a link to grants, from which you can obtain information on those previously approved What an extraordinary way to obtain ideas for a grant proposal of your own. Please do not misunderstand me. I am not advocating using someone else's research idea. However, many of the proposals are such that they provide opportunity for similar accomplishment in a different region. Additionally just reading through the text of abstracts for other grants provide a fertile ground for new ideas.

Writing the Grant Proposal

You have the idea and want to write a grant. So write it. This is not intended as a detailed instruction about writing an NSF grant proposal and after reading you will agree that it is not. I would like to share a few ideas that made writing our grant much easier and a few that would have helped if we had known. Hopefully they will assist you if you decide to write your grant proposal.

The first is too obvious, but I did not recognize the help you can get from the NSF just by asking. I'm not sure why, but somehow I thought that if we talked with the contacts at NSF before submitting the proposal it would reflect badly on us. Since then I have discovered that most of them are in fact us. By saying this I mean that educators like you and I hold many of the positions at the NSF. They go to the NSF for a few years and then return to teaching or research. Everyone I have communicated with at NSF has been very helpful and considerate. If you have a question about what this form is for or what is really wanted by this question, then ask the contact for that area. Send an e-mail or pick up the phone. Don't be as hesitant as I was.

Obtain the Program Announcement for the program as soon as possible. The announcement will have the closing date of the program, the last date for submission. It is not unusual for the closing date to be six months before the grants will be awarded.

The closing date for submittal can lead to budgeting problems do to the long lead-time. You are really formulating the budget approximately a year before starting the actual project. It is possible to have some significant changes before you commence. In our case involving computer equipment it turned out to be a positive effect because of the decreasing prices. However, we were asked to revise our budget downward to reflect the lower prices immediately prior to approval. It could work the other way but I'm not sure they would ever call and ask you to increase your budget.

The Program Announcement also has a contact phone number / e-mail listed. As previously mentioned, don't hesitate to use them. Details of your proposal requirements are contained within the announcement. It will list what can be funded and what cannot be funded. Also will be any special requirements that deviate from the Grant Proposal Guide requirements. Program Announcements will list the range of dollars that can be awarded for each individual grant and the funds required to be contributed by the receiving institution. Our particular grant is a matching funds grant as most are. This means the NSF agrees to give a certain amount for the proposed project and the college is required to match dollar for dollar what the NSF supplies.

As you read the Program Announcement make notes of the things that pertain to items you have to do or show in your proposal. The announcement tells you what the program is targeting for approval. Check your list to ensure you have addressed each item in the proposal such that someone reading it could just check off a list as they review it. The reviewers do use a checklist and so should you.

Develop the need for your project in the strongest possible way. Projects with a well-developed and articulated need showing how a recognized deficiency is alleviated through accomplishment of the proposed project have a head start in the approval process. I have heard that if you can tie the need to a widely known area of underachievement then your project stands a much better chance of being accepted.

The rate of acceptance varies by the program applied for. At the NSF web page you can review the statistics from previous years. On average it appears that about one third of proposals submitted are accepted and funded. In my opinion those are pretty good odds.

One of the most helpful things we did prior to actually writing the grant proposal was to communicate with someone who had recently written a funded proposal in the same general area. We utilized their experience and prior work to answer many questions about the mechanics of writing the grant. If you do not have the opportunity for that direct communication, then you can get copies of prior grants from the NSF. The NSF will of course remove the personal information before sending the grant requested. What is useful isn't so much the material, but rather the formatting of what was submitted. By having a previous grant to review you can answer many questions you will have about how to format this or how should this item look. Depending on size, your college will probably have prior grants and someone who is familiar with the process.

There are many opportunities for you to throw your hat into the project proposal ring. The odds are about one in three. With an idea and a little homework on your part the grant proposal is almost done. Hopefully your college will also obtain some much-needed monetary assistance.

A PAINLESS INTRODUCTION TO GETTING STARTED WITH VIDEOCONFERENCING USING NETMEETING

Robin Snyder
Dept. of Information & Operations Management
University of North Carolina, Charlotte
9201 University City Blvd.
Charlotte, NC 28223-0001
rmsnyder@email.uncc.edu
(704) 921-9814
http://www.uncc.edu/~rmsnyder

Abstract

NetMeeting is free video-conferencing software from Microsoft that, for the price of an $80 camera at both ends, can be used to do simple video conferencing through the Internet. Capabilities include audio, video, white board, chat room, etc. This presentation/talk will present/demonstrate how to get started with NetMeeting, important installation issues, setup procedures, troubleshooting techniques, what you need to know about TCP/IP, Windows 95, and NetMeeting. In essence, the minimum and most important things that you need to know to get started. You can install and use NetMeeting in about five minutes, but you do need to know what to do if not everything goes right.

Introduction

Microsoft NetMeeting allows real-time communication and collaboration over the Internet (i.e., TCP/IP) with capabilities such as application sharing, electronic whiteboard, text-based chat, and file transfer features. Common usages of videoconferencing, as provided by NetMeeting, include virtual meetings, documentation collaboration, customer service, telecommuting, distance learning, technical support, etc. Anyone familiar with Windows should be able to get started and be productive right away.

Getting started is easy. Just download the free software from Microsoft, install it on two different computers with audio and video capabilities that are connected to the Internet, log onto the same ILS server, establish a connection, and start using NetMeeting to enjoy all of those nice features mentioned above.

Of course, if it worked that way, you would not be reading this paper. As we will see, the probability that there are not problems is, indeed, very small, so you need to know about some of those problems and how to deal with them. Just as learning tennis can be very difficult if you spend all your time chasing the ball, so can using NetMeeting be frustrating if you spend all your time trying to find out what is wrong and then trying to fix it. So, as we cannot even begin to cover all aspects of NetMeeting, we will concentrate on the aspects of NetMeeting that are important but not always initially obvious.

The software: versions and builds

Although almost two years old, the definitive reference for NetMeeting is still [1]. Especially useful is the large part of the book dealing with problems using NetMeeting and how to deal with them. This paper contains many problems that were encountered by the author while using NetMeeting, how the problems were dealt with, and some systems design to make using NetMeeting more convenient.

Of course, the most recent information is available at the Microsoft NetMeeting site at http://www.microsoft.com/netmeeting/. For example, on Friday, April 23, 1999; the following was at the top of the Microsoft NetMeeting web page.

> ***NetMeeting 3 Beta has Arrived! The next major upgrade of the Windows real-time collaboration and conferencing client contains an easy to use web phone as well as a tool for corporate productivity. Download the Beta here!***

The new version offers, among other things, improved performance, improved applications sharing, a more flexible interface, enhanced security, broader standards support, etc.

Due to the asynchronous nature of the software, there always seem to either be glitches that need to be fixed, or improvements that have been long overdue. As Summers states, "Getting NetMeeting to work sometimes can be frustrating, to say the least" [1, p. 10]. No wonder Microsoft gives it away for free. Since there are so many things that could go wrong, the support costs would be huge. In addition, the concept of grabbing market share early also plays a role. So, try it and use it free while you can.

As is the case with most communications software where there is a sender and a receiver, it is usually the case that, during testing, more effort is made in insuring compatibility between the same version than with different versions. This applies to camera drivers, etc., as well.

- **Rule #1: Make sure both sides are using the same version of NetMeeting.**

To check your version, select "**Help**", "**About Microsoft NetMeeting**". Notice the number in parentheses after the version number, something like the following.

Microsoft NetMeeting (TM)

Version 2.1 (4.3.2203)

That number, **4.3.2203** is called the "build" number. A "build" is usually a full- compile of the entire system at some synchronization point in the development of the software. Microsoft likes to keep all groups in the team in synch by periodic builds, on time frames anywhere from twice a day to several days, or weeks, apart. Although it is not supposed to matter that much, little things can cause big problems in asynchronous communications software.

- **Rule #2: Make sure both sides are using not only the same version, but also the same "build" of NetMeeting.**

Why does NetMeeting crash Windows?

This lack of compatibility testing between versions, builds, and/or drivers seems to be particularly true with respect to cameras and camera drivers. Since audio drivers and interfaces have been around longer and seem to be better understood, they tend to be less problematic. When NetMeeting crashes, as seems to happen quite more than one would want, is Microsoft just not doing a good job on software design? Let's do a quick analysis.

- If there are **n** versions, or builds, of NetMeeting, there are **n*n** ways in which to test those versions between one sender and one receiver.
- However, adding **m** different cameras, with **p** versions of each camera driver, there are **(n*n)*(m*m)*(p*p)** number of ways in which to test combinations of NetMeeting, cameras, and drivers between one sender and one receiver.

For example, if there are **4** versions, or builds, of NetMeeting that might be used within a group, **8** possible cameras on the market, and **3** versions of each camera driver, there are **(4*4)*(8*8)*(3*3)**, or **9,216** possible combinations that must be tested. Obviously, there is plenty of room for subtle problems that crash either NetMeeting or Windows.

Programming interfaces

Accordingly, Microsoft has attempted to simplify the matter by developing an API (applications programming interface) for digital cameras and for NetMeeting. The API for digital cameras is called Microsoft Video for Windows. It can be used by applications programs written in languages such as Visual Basic, C++, Delphi, etc., to grab images from a camera, or to record an AVI (audio-video interleave) file. Microsoft has provided a program **vidcap32.exe**, intended for developers of digital camera software, that allows the recording of an AVI file using the Microsoft Video for Windows interface. If your camera works with **vidcap32.exe**, it should work with NetMeeting, but there may be other problems. You can use the Media player, **mplayer.exe** in the Windows directory, to play your recorded AVI movie file.

Microsoft has also developed a SDK (software development kit) for NetMeeting that allows the incorporation of NetMeeting features directly into applications and web pages using programs written in languages such as Visual Basic, C++, Delphi, etc., primarily via OLE (object linking and embedding), COM (component object model), and ActiveX interfacing conventions.

Installation

Installation is simple. Just follow the directions. Don't worry too much if you don't know which options to select or what information to provide. For example, NetMeeting needs information about yourself that will represent you at any meetings of which you will be a part. However, once NetMeeting is installed, any of the options can be changed by selecting "**Tools**", "**Options**", and modifying the previously selected options.

For example, you may want to provide accurate information for in-house video- conferencing, but not provide accurate information to a public meeting place. Who knows, someone may want to find out who you are and stalk you or otherwise cause problems.

The program **conf.exe** starts NetMeeting, although installation will create a shortcut icon.

Digital video cameras

Digital video cameras vary in their compatibility with NetMeeting. From personal experience, the parallel port Connectix QuickCam (now the Logitech QuickCam) works very well with NetMeeting on a laptop running Windows 95, despite the somewhat fuzzy picture (the company has since introduced an enhanced version). On the other hand, the Intel Create and Share USB (Universal Serial Bus) camera provides a sharper picture, but tends to crash both the computer, when running Windows 98, and NetMeeting after about 10 seconds. So, an updated driver was downloaded and installed.

- **Rule #3: Make sure both sides have the latest video drivers for their cameras.**

One annoying point was that the updated Intel driver required you to find your original certificate to get a validation code (which is bothersome, to say the least), and then reinstall the entire Intel software system just to get the new driver installed. After installing the updated camera driver from Intel, the computer no longer crashed, and the NetMeeting connection worked flawlessly for 20 minutes when on the same local area network, but crashed again after about 10 seconds when going through a remote connection through the Internet. This problem has still not been satisfactorily resolved. However, the same connection worked flawlessly with video from one side, via the QuickCam, and only audio from the side with the Intel Crete and Share camera disabled. Of course, as new drivers are introduced, cameras that work flawlessly might start having problems, and cameras that caused problems might start to work without problems.

- **Rule #4: As you upgrade NetMeeting and/or camera drivers, be prepared to start the problem-solving process all over again.**

If you plan on using NetMeeting in a production environment, you must be prepared for such problems. Plan for the needed support before you commit to using such systems on an official basis.

Audio and video communication

Obviously, sending higher quality audio or video requires more bandwidth. When getting started, unless you have sufficient bandwidth, choose settings that minimize the bandwidth requirements.

- **Rule #5: Unless you have sufficient bandwidth, choose settings that minimize bandwidth requirements.**

A picture that is twice the width and twice the length requires four times the bandwidth, without compression. However, making a smaller picture larger, pixel for pixel, does not require more bandwidth on the communications channel.

Company firewalls can also cause problems in getting NetMeeting packets through the firewall. They can also create delays that limit the QOS (quality of service) that might be required for a satisfactory connection.

When communicating, feedback problems in the form of audio and video delays, and return echoes, can be annoying. Remember that when you speak into the microphone, the sound is converted to digital audio, sent to the other station, converted back into sound and played from the speaker on that station. Some of that sound will go into the microphone on the other side, and be returned to you, after a delay of several seconds. One way to minimize the problem is to use a earphone headset with microphone that cuts back on the feedback. One can also position the speakers and microphone in various ways to reduce the problem to a manageable level.

- **Rule #6: Be prepared for audio and video delays, and return echoes from the other side.**

Setting up a mini-Internet for testing purposes

The Microsoft ILS (Internet Locator Service) makes it easy for participants to locate each other in order to participate in conferencing sessions. But, that is about all the ILS server really does. To create your own ILS server requires that you have a computer running Windows NT. But, for testing purposes, all you need is the IP address of the other station. That's a lot easier than setting up your own ILS.

- **Rule #7: To avoid setting up your own ILS server, use the IP address of the other station to directly call that station.**

If you are connecting two stations that are on the same network running TCP/IP, then you can call the other station by using the IP address of the other station. How do you determine the IP address of a station? The program **winipcfg.exe**, located in the Windows, directory, can be used to determine the IP address of a station.

- **Rule #8: Use winipcfg.exe to determine the IP address of a station.**

However, you may want to test a configuration where you do not have to know the IP addresses for each station. Many organizations assign IP addresses dynamically via DHCP (Dynamic Host Configuration Protocol). You can always request a fixed IP address. Since many organizations have departments that have their own web server, and a web server needs a fixed IP address, those organizations know how to obtain fixed IP addresses. In any case, you might want to set up your own mini-Internet for testing purposes where each station involved in the video conference has its own fixed IP address.

In addition, if your NetMeeting setup does not work on a mini-Internet consisting of the two computers, cameras, etc., directly connected by a simple network, say, in the same room, then it is unlikely that the connection would work going through the real Internet. Thus, one way to get started with troubleshooting is to create your own personal mini-Internet on two computers on the same local area network. Here is a short introduction on how to do this.

At any point in time, each computer on the Internet can have one or more unique IP addresses. (You might have two IP address if, say, you were connected to the Internet via a network connection and modem connection at the same time). Of course, if you are setting up your own mini-Internet, you can pick any IP address you want. For example, suppose that my mini-Internet is to be on a home network consisting of a laptop and a desktop computer connected by a 10BaseT Ethernet hub running TCP/IP. In this case, the laptop has an IP address at school which does not change (actually, it would expire in 10 days if I did not connect to the network in that time). If the laptop IP address is **152.15.72.42**, I might want to assign the desktop computer the IP address **152.15.72.43**. One way to specify an IP address for a computer is to select "**Start**", "**Settings**", "**Control Panel**", "**Network**", "**TCP/IP**" (for the network adapter), "**Properties**", "**IP Address**" tab, "**Specify an IP address:**" and specify the "**IP address:**" as **152.15.72.43**. The "**Subnet Mask:**" also needs to be specified. Without getting into specifics, a subnet mask of **255.255.255.0** will work. (For TCP/IP fans, a subnet mask of **255.255.255.254** should also work). Then select "**OK**", "**OK**". You will need to restart the computer for the changes to take effect. Remember, after running your own mini-Internet, you should change the "**Specify an IP address:**" to the original value before connecting to the Internet. Otherwise, you will not be able to connect to the laptop, or some other IP addresses that are close to the laptop's IP address, when you reconnect to the Internet through your <u>ISP</u> (Internet Service Provider).

The command-line program **ping.exe**, located in the Windows directory, can be used to troubleshoot an IP connection.

- **Rule #9: Use ping.exe to determine if TCP/IP is working correctly on a station and between stations.**

To see if TCP/IP is installed correctly on a station, ping the loopback IP address **127.0.0.1** using the following command from that station.

```
ping.exe 127.0.0.1
```

To see if you have a TCP/IP to the other station, ping the IP address of the other station. For example, to ping IP address **152.15.72.42** from IP address **152.15.72.43**, use the following command.

```
ping.exe 152.15.72.42
```

To avoid users from having to remember IP addresses, the **lmhosts.** file, a text file located in the Windows directory, can be created/modified to associate a meaningful name with an IP address.

- **Rule #10: Use the lmhosts. file to create your own personal DNS server.**

Here is the **lmhosts.** file to associate the name **Robin** with IP address **152.15.72.42**, the name **Michelle** with IP address **152.15.72.43**, and the name **School** with IP address **152.15.100.120**.

```
152.15.72.42 Robin
152.15.72.43 Michelle
152.15.100.120 School
```

Typically, a <u>DNS</u> (Domain Name Service) server will map domain names to IP addresses, but using the **lmhosts.** file avoids the need for a DNS server. Keep the **lmhosts.** file small, though, because it is accessed on each and every conversion of a name to an IP address. But, it's in the disk cache, so it's not that much overhead for occasional reference. For example, when making a NetMeeting call, it would be accessed only on the initial call. After the IP address is ascertained by NetMeeting, there is no need for another conversion during that call.

Thus, if **Robin** wanted to call **Michelle**, **Robin** would type in **Michelle** for the IP address. Note: After the first call, **Michelle** would be on the recently called pull-down list.

NetMeeting access via the web

Microsoft Internet Explorer supports the use of **callto:** as a service, much like **http:**, **file:**, **ftp:**, etc. For example, when browsing the Internet, the following have the same effect.

http://www.uncc.edu
http://152.15.100.120
http://School

In a similar manner, the following are ways of calling **Michelle** at IP address **152.15.72.43**.

callto:152.15.72.43
callto:Michelle

And, just as a link to **www.uncc.edu** can be embedded in an HTML link as

<A HREF="http://www.uncc.edu">UNCC</A>

so too can a call to **Michelle** be embedded in an HTML link as follows.

<A HREF="callto:Michelle">Michelle</A>

This is how, incidentally, NetMeeting can send an email message to a person, provided the other person's email message is known, with a message asking them to call back. If the recipient's email system (e.g., Microsoft Outlook) supports the **callto:** tag, or if the recipient's browser (e.g., Microsoft Internet Explorer) supports **callto:**, it is an easy matter for the recipient to call back.

- **Rule #11: Use the callto: service to provide NetMeeting access for web pages accessed by Internet Explorer.**

Rule summary

This paper has provided some practical advice for setting up and using Microsoft NetMeeting for video conferencing. Here is a summary of the rules given in this paper.

- **Rule #1: Make sure both sides are using the same version of NetMeeting.**
- **Rule #2: Make sure both sides are using not only the same version, but also the same "build" of NetMeeting.**
- **Rule #3: Make sure both sides have the latest video drivers for their cameras.**
- **Rule #4: As you upgrade NetMeeting and/or camera drivers, be prepared to start the problem-solving process all over again.**

- **Rule #5: Unless you have sufficient bandwidth, choose settings that minimize bandwidth requirements.**
- **Rule #6: Be prepared for audio and video delays, and return echoes from the other side.**
- **Rule #7: To avoid setting up your own ILS server, use the IP address of the other station to directly call that station.**
- **Rule #8: Use winipcfg.exe to determine the IP address of a station.**
- **Rule #9: Use ping.exe to determine if TCP/IP is working correctly on a station and between stations.**
- **Rule #10: Use the lmhosts. file to create your own personal DNS server.**
- **Rule #11: Use the callto: service to provide NetMeeting access for web pages accessed by Internet Explorer.**

Good luck with your conferencing using NetMeeting.

References

[1] Summers, B. (1998). Official Microsoft NetMeeting Book. Redmond, WA: Microsoft Press.

VISUALLY TAKING CLASSROOM ATTENDANCE QUICKLY AND EFFICIENTLY USING A COMPUTER

Robin Snyder
Dept. of Information & Operations Management
University of North Carolina, Charlotte
9201 University City Blvd.
Charlotte, NC 28223-0001
rmsnyder@email.uncc.edu
(704) 921-9814
http://www.uncc.edu/~rmsnyder

Abstract

Despite advances in the electronic age, class attendance is still an important aspect of learning. In addition, it is important to be able to match names to faces, add comments about students during the semester for assessing student achievement, etc. Many academic institutions now provide instructors with an electronic copy of their class listings. Given these listings, the goals for the software system to be demonstrated are as follows. Before the first meeting, set up the class database in less than 10 minutes, to include all of the dates for the class meetings. Then, during the first class, with the use of a digital camera costing less than $100, acquire, process, and match pictures of 40 students to names in less than 10 minutes. Updates are equally easy. Then, at the start and, if desired, end of each class meeting, take attendance in less than 1 minute. (The software works without pictures, but it is easier to take attendance with pictures than with names). All the information collected is available for future use and/or analysis via Excel spreadsheet output. Students seem to take visual attendance taking on a computer more seriously than manual attendance taken on paper.

Introduction

One complaint in the increasingly information-oriented computer age is that people become just numbers, or, perhaps, just names. But, today, computer technology has advanced to the stage that it is cost-efficient to use imaging technology to improve the situation to the point that people are more than numbers or names. Images of students provide a nice way to put faces to names.

Although many institutions do take student pictures, those pictures are usually not made available to teachers, for a variety of reasons. It is now a simple matter to connect an $80 digital camera, the type designed for simple video-conferencing, and start grabbing images. High resolution is not that important, so the higher performance $150 to $200 cameras are not required.

This paper builds on [1], adding new observations, discoveries, and design decisions involving the methodology, and new features of the software itself.

History

The program to be described/demonstrated started as single-feature application that would facilitate the easy taking of attendance at the start of class using pictures of students.

The old method was to print out a roster, manually annotate a column with the date of the class, and to manually checkoff each student. Since this method was paper-based, it tended to be error-prone and messy. It was also easy to misplace the paper roster. And, getting summary information beyond what was readily visible was out of the question.

The new method is easy to setup, easy to use, and, once it is backed up, is always available and hard to misplace or otherwise lose. The data is available for additional analysis and research purposes.

Data flow analysis

An analysis of the data flow and classroom actions were used in the design of the user interface in order to minimize the work done during class by the teacher in obtaining the images. Here is a summary of the improvements made that follow the order in which actions are performed.

The old method was to use the program/driver, supplied by the camera manufacturer, to obtain the images. The images were saved to disk, usually as bitmaps, and the program then obtained the images from the directory where the images were stored. The problem with this method was that each camera had its own peculiar way of starting, taking images, and saving images. Each program was located in a different location, saved its images in a different location, and had different options and settings. To make it easy to implement an easy-to-use system and make it easy for the user was difficult.

The new method uses the Microsoft Video for Windows API (Applications Program Interface) to directly access the video device via the Windows operating system. This has several advantages.

- The video device (i.e., the camera) appears to be built into the application software.
- The images can be grabbed directly from the camera without the intermediate directory problem.
- The user need not specify or otherwise configure the unique features of the camera.
- The user can easily specify any video device that is attached to the system. The program can determine, via the API, whether the video device is working and report the status to the user.

The old method of taking pictures relied on taking individual snapshots of the student. Many students do not want to smile, but, after about 2 to 3 seconds in front of the camera, most students do crack a smile. The author has gotten quite good at anticipating this, but sometimes the picture is not as good as desired. For example, the student may glance away, blink, etc. It wastes time to take too many pictures.

The new method, using direct access to the video device via the API, is to take 5 pictures, at 1/4 second intervals, and allow the teacher to pick the "best" of the 5 images. This can be done while the current student is getting up from the chair and the next student is sitting down. This results in much better images during the initial shooting without increasing the time needed to take the pictures. A student can always, however, request another picture at the start of another lesson, since it is so easy to do, once the proper lighting is in place.

Having the students arrange themselves into order via height might save some time since, otherwise, the camera needs to be adjusted for very short or very tall students.

After all of the pictures are taken, the pictures are cropped to a standard size, which takes less than one second apiece. Since the cropping operation has been made very easy and efficient, the initial picture need not frame the student exactly. This saves time during the taking of the pictures.

After the pictures have been cropped, the pictures are matched to the student names, most of which are already in the system from the electronic lists provided by the Registrar.

The old method of matching pictures to names was to go though the pictures, one by one, and have each student identify their picture. The system makes this easy to do by maintaining and updating separate lists of who has and has not been matched, so it gets easier as more students are matched. Then, the pictures are arranged on the room grid according to where they are sitting.

The new method, not yet complete, will use drag and drop of the name matching the student image to a room grid so that the two operations can be combined into one operation. Aside: Technically, this requires converting the code for the room grid into an object/component so that it can be easily used in more than one context within the program.

How much information to record

The author has tried several ways of taking attendance before deciding on a satisfactory method.

Initially, a student was either present or absent (i.e., one bit of information was used). However, it was sometimes hard to decide if someone who arrived late, or left early, was present or absent for that class. Students tended not to like the all-or- nothing approach.

The next approach was to record the actual time a student arrived or left. This was too much information. It disrupted both the teacher and the student to have to record comings and goings. And, sometimes, the recording was done after class and not during class, making some of the times inaccurate. The data collected was just not that useful.

The next approach, and the one currently used, is to use two-bits of information in the following way.

- At the start of class, each student is marked present or absent.
- At the end of class, each student is marked present or absent.

This usage has the following interpretation for "**present**", "**arrived late**", "**left early**", and "**absent**".

- A student present at the start and end of class is "**present**" for that class.

- A student absent at the start of class and present at the end of class "**arrived late**" for that class.
- A student present at the start of class but absent at the end of class "**left early**" for that class.
- A student absent at the start and end of class is "**absent**" for that class.

What about a student who actually "**arrived late**" and "**left early**", but was present for most of the class? Such cases are handled on a case by case basis by the teacher, but can usually be resolved by making some decision short of being "**absent**" for the entire class. A similar thing can be done for a student who is "**present**" at the start and end of class, but left during class for an extended period of time.

Taking attendance at the start of class takes about one second per student. This is due, in part, to the fact that students tend to sit in the same place during every class meeting. So, the software allows the picture to be dragged to where the student is sitting. The software remembers the placement of each student. So, in most cases, the teacher need only go down each row and click off each of the students present, which can be done very quickly.

The teacher must initially select a class and a section for that class, if that class has more than one section. The system remembers each and every setting when the teacher exits the program, so that when the program is restarted, most everything is the same as when the teacher exited the program. There are a few exceptions. One exception is that the initial class date is always as close to today's date as possible, so that the date need not be set when taking attendance in class.

The two classtime modes are as follows.

- "**Start of Class**"
- "**End of Class**"

The three display modes are as follows.

- "**Everyone**" displays everyone in the class.
- "**Present**" displays those marked present according to the above classtime modes.
- "**Absent**" displays those marked absent according to the above classtime modes.

The initial display and classtime mode is "**Absent**" at "**Start of Class**". Everyone is initially "**Absent**" at "**Start of Class**", so everyone's picture appears. Each student who is present is marked present at the "**Start of Class**" by holding the **Shift** key and left-clicking on the picture. At that time, the image disappears, being replaced by the "**Secure Colors**" image (described later) that displays the text of the student's name. Students whose pictures remain visible are absent. Those students make sure that I know that they are, in fact, present. Students seem to take visual attendance taking more seriously than manual attendance taking via paper rosters.

Taking attendance again at the end of class, however, is not very convenient. An interface convention simplifies the taking of attendance at the end of class.

- Whenever a student is marked present at the start of class, that student is also marked present at the end of class. This is done until the first time that a student status has been changed at the end of class. Thereafter, the status is only changed at either the start of the end of class, not both.

Thus, if the teacher does nothing at the end of class, the system defaults to the original all-or-nothing "**present**" or "**absent**", mode.

At the end of class, the teacher need only click on "**End of Class**" and click on any students who have arrived late. If any students have left early, the teacher can click on "**present**" and do a **Shift**-click on their picture to mark them as "**left early**". Many students who arrive late will check at the end of class to make sure that they have been marked "**arrived late**" and not "**absent**".

A shortcut on each student's picture allows the direct setting of any of the four possibilities, "**present**", "**arrived late**", "**left early**", or "**absent**", in addition to some other operations (e.g., "**Send Email**", "**Add Comment**", etc.).

Teacher comments about students

The teacher can double-click on a student picture, or name, and be taken to a screen that allows the teacher to see the attendance status of the student, and also to enter text comments, either good or bad, about the student. Such information is useful in assigning class participation grades at the end of the semester. This information is stored in a text file, one file per student, but these details are transparent to the teacher. Automated support adds the date that the comment was entered.

Secure colors

But, how can a teacher add such comments before, during, or after class, if necessary, when the screen is visible to the student, as it would be via a projection display device? Since multiple monitor support, as provided in Windows NT and Windows 98, is not usually available to teachers in class, the software allows the teacher to easily set secure background and foreground colors for information not to be displayed to the student. Typically, many projection systems do not display colors at the same color depth as computer monitors. For example, in the author's case, setting the foreground and background to near shades of dark gray, the text is still readable on the computer display, but merges to the same color of gray on the projected screen visible to the students. This avoids the problem of inadvertently selecting, say, the screen where scores are entered and allowing students to see other student scores, etc. Since different sections may be taught using different projection systems, this information can be customized for each section rather than a one-size-fits-all setting.

Attendance policy

The author's attendance policy, posted on the author's web system, goes as follows.

- Class attendance is very important. There is a high correlation between class attendance, doing assigned work, and the grade a student earns in a course.

- One student wrote: ***I found it more useful to just look at your webssite [sic] than to actually go to class and listen to you for an hour and a half.*** That student earned a **C** for the course, so, apparently, there was something going on during class that was missed.

- You are expected to attend class whenever you can. Students that attend class tend to do better on assignments, exams, etc. Also, there are points allocated for class participation. If you are not in class, you cannot participate.

- However, from time to time, you may be unable to attend class.

- If you miss class, then, within on week of the absence, you are required to send an email message to me providing a short explanation of why you missed class.

- If you do not provide this email message within one week of the absence, than missing class will directly lower your class participation score.

- If you do provide this email message, then your class participation score will not be lowered because of missing class, but you will need to make sure that you compensate by participating more in the classes that you do attend.

The subject line of the email message is encoded in a specific form, but the software does not currently synchronize the student's email submissions with the teacher's recorded attendance data. This is an area for future work.

Reports

Several reports are generated, in text form, that can be copied-pasted into Excel in order to create a chart. A future improvement will use OLE COM Automation to automatically generate the chart. Another improvement will chart the data within the program itself. This is being delayed until it becomes more obvious as to which charts and chart options are most important. The charts have been omitted from this paper for formatting reasons.

The first chart data is for a line chart of "**present**", "**arrived late**", "**left early**", and "**absent**" for each lesson during the semester. On the chart for the Spring 1999 semester, it was readily apparent that, after the first week, when students are adding and dropping courses, absenteeism tended to increase linearly as the semester progressed. The exam dates were also readily apparent, as these two dates were the peaks for the "**present**" attendance for the semester. It was also readily apparent that absenteeism and late arrivals were much more significant factor for the class meeting at 8:00 A.M. than for the either of the classes meeting at either 11:00 A.M. or 12:00 noon.

The second chart data is for a scatter chart of "**Exam Score (pct)**" vs. "**Attendance (pct)**". Although the variability is significant, the linear regression equations for two different classes during the Spring 1999 semester is as follows.

"Exam Score (pct)" = 0.1465 * "Attendance (pct)" + 66.67
"Exam Score (pct)" = 0.1784 * "Attendance (pct)" + 67.18

Note: In this case, the exam score did not include the final exam, as the final draft of the paper was submitted before the final exams.

Canceled class

The dates for each class are specified by selecting dates from a visual calendar. In order to get accurate reports, it is easy to annotate a class date as a date on which class was canceled. Such canceled lesson dates are not used in any reports.

Summary

This paper has presented an overview and some design and implementations considerations of a system for visually taking classroom attendance quickly and efficiently using a computer.

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INFORMATION SYSTEMS CURRICULUM: ISSUES FACING THE REGIONAL CAMPUS

Dewey A. Swanson
Computer Technology
Purdue University
4601 Central Avenue
Columbus, IN 47203
(812) 348-7238
dswanson@iquest.net

INTRODUCTION

This paper will discuss issues dealing with the technology program curriculum at a regional campus. Specifically, this paper will discuss the Computer Technology (CPT) program in Purdue University's School of Technology and the issues that face the Columbus regional campus. Insights and approaches to coping with the campus challenges in curriculum are offered. In other cases, we simply point out the challenges that we face as a regional campus of Purdue University. Finally, this paper will try to look at issues that face the regional campus in the next millenium and how these issues will effect the curriculum at the Columbus campus.

BACKGROUND OF THE REGIONAL PROGRAM

Purdue University's Statewide technology programs were designed to extend the university's technology programs throughout the state of Indiana. Purdue University is Indiana's land-grant university with more than 35,000 students on the West Lafayette campus and another 20,000 on regional campuses. Purdue Statewide Technology is a unique partnership between education and business, industry and government formed to meet Indiana's needs for trained technologists and technicians. The curriculum is the same as the West Lafayette campus; the faculty and equipment are similar to those found on Purdue's West Lafayette campus. The School of Technology at statewide sites provides trained staff for technical courses and the laboratory equipment. Local public and private institutions provide support courses, services and facilities. There are nine regional sites used in the state of Indiana. At the Columbus site, there are six Associate Degree programs offered and one Bachelor Degree program offered.

The Computer Technology (CPT) program in Purdue's School of Technology at Columbus offers a two year Associates Degree. CPT is a blend of business and computer applications. The program prepares students for existing and emerging jobs and careers in the application of information technology. The CPT program offers business, computing and communication expertise.
Indiana University Purdue University Columbus (IUPUC) is a part of the Indiana University-Purdue University Indianapolis (IUPUI) system and is the Purdue Statewide Technology partner in Columbus. Purdue students take IUPUC courses that are used to fulfill degree requirements. These courses are courses not offered within the School of Technology. The IUPUC main campus is in Columbus, Indiana. Classes are also taught in several other communities in the area. There are approximately 1800 students with 30 full-time and 120 part-time faculty. Being a commuter

campus IUPUC has approximately half of the students over 25 years of age and 70% of the students are part-time.

CURRICULUM ISSUES AT THE REGIONAL CAMPUS

Introduction to Curriculum Issues

Curriculum is an area that can be difficult for the university to deal with even when it is self-contained. A regional campus must deal with curriculum issues through the main campus, which can complicate matters. The situation at the Columbus campus is even more complicated. Since our program is a Purdue University program, the School of Technology is responsible for the curriculum. However, the Purdue School of Technology at Columbus is dependent upon IUPUC to provide support courses for our students. This requires coordination with IUPUC. Also, we deliver courses to IUPUC as a service to the host university. As can be imagined this process can lead to numerous curriculum issues including:

Development and Maintenance
Student Needs
Coordination with Host Campus
Local Industry Needs
Hardware and Software

Development and Maintenance

The development and maintenance of the CPT curriculum is the responsibility of the department level curriculum committee. Courses are supposed to be consistent between main and regional campuses, with committees made up of faculty from both main and regional campuses. Issues range from developing course objectives and content to selecting textbooks. With the majority of members located at the main campus, regional campuses have a problem with representation on the committee. This can be a severe problem for the regional campus. Although all members are Purdue faculty, in the CPT department, the goals of the regional campus and the main campus tend to differ. The main campus is concerned with the Bachelor's Degree since that is the degree most students pursue. A BS in CPT is not offered at any of the regional sites. The Associates Degree is the terminal degree for many of the students in the statewide system. This has resulted in conflicts within the department. Placement of courses in the curriculum and content of the courses is very critical. A class changed from a sophomore level to a junior level course will not be offered at the regional campus. The regional campus wants to have the Associate Degree to be a marketable one for the student. At the main campus, the Associate Degree is not a priority since the vast majority of students continue on to earn a Bachelor's Degree. At the present time the struggles continue.

One potential solution discussed is a separate AS program for the regional campus where this will be a terminal degree for most students. This would allow programs to be more flexible to serve needs of local communities and make the two-year degree more marketable for students staying in the community. One major drawback to this is the fact that a strong recruiting factor is the idea of same curriculum as Purdue's main campus. The ultimate solution to this challenge is still to be determined.

Student Needs

Regional campus students take longer to graduate. At the main campus in West Lafayette there are more traditional students finishing a BS degree in a four to five year period. At Columbus, the majority are taking classes while working full-time. An Associate's Degree can take four to seven years and in some cases even longer. This can be a nightmare for the student as well as administration. As an example, in the scheduled May 1999 graduation the CPT students are representing four major codes (this represents four major changes to the curriculum). As one can imagine this can be challenging for administration at the Columbus campus, especially dealing with students who entered from programs more than a generation old. This can require keeping classes from an old program on the schedule. Sometimes there is not a good replacement course in the new program, for an older program course. Typically, there are classes that substitute; however when dealing with older programs this is a more difficult task and a good substitute may not exist. In some cases students switch to the new program, especially if there are features in the new program that are more enticing. In other cases, a little creativity helps. In an older program, students were required to take two semesters of Cobol for their programming courses. In the current program, Cobol is an elective. Students in the old program who completed the two Cobol courses were allowed to count them in the program. However, if a student had one semester of Cobol in the old program, they use the Cobol as an elective and take the current two-course sequence in programming using Visual Basic. Staff at Columbus must work closely to solve problems on a case by case basis.

Coordination with Host University

Major changes in the curriculum in CPT department are introduced frequently. When a new curriculum is introduced, it is more difficult to implement at the regional campus especially in Purdue's statewide system. As with any change in curriculum, it must be approved at the main campus through appropriate committees in CPT, School of Technology and university wide. This path is important in coordinating changes in courses that CPT provides as service courses within the School of Technology and the university. For the School of Technology programs at the regional campus, school and university committees at the main campus handle most difficulties with curriculum. With a change in curriculum the regional campus must work with the host university in providing non-technical classes for the new curriculum, determining which courses will substitute for Purdue courses. The other side of the curriculum issue is that the School of Technology at Columbus provides support courses to the host university IUPUC, when the technology courses change, this can have an effect on the host university as to which classes they use and concerns about course content. The main problem in this situation is that in Purdue's statewide system the host universities are not represented in the process. In defense of the main campus it would be very difficult to coordinate the curriculum change at Purdue along with nine host sites. An example is the CPT 135 course, which is a three credit hour introductory class with a lecture and lab. This course is utilized by most programs at IUPUC to fulfill the computer class requirement. In the new proposed curriculum this course is going to be changed to a two credit hour class. The problem this creates for IUPUC programs is when a program requires three credit hours of computing classes for a degree. At the present time, our campus is looking for a course that we may offer as a substitute that will still satisfy the needs of our host university.

Local Industry Needs

The Columbus campus faces a very delicate issue in regards to curriculum. It is a double-edged sword. A very effective recruiting tool is stating the fact that the curriculum at the Columbus campus is the same as the main campus at West Lafayette. Faculty are hired and go through the same standards in order to get tenure. Courses are developed and delivered system wide. This is a very effective recruitment tool. Purdue University is a recognized national leader in technology education with over 9600 students in the program, graduating 1400 a year and with ninety-nine percent job placement. In the CPT department a goal is "one curriculum, many sites". Many students like this distinction.

Along with the prestige of the Purdue curriculum is the problem it creates at times. As was stated earlier, Purdue Statewide Technology is a unique partnership between education and business, industry and government formed to meet Indiana's needs for trained technologists and technicians. Implied in this statement is that curriculum is flexible to meet the demands of the local community. There are several large companies in Columbus along with many mid-size to smaller companies. Typically, there is informal communication between local industry and the campus. Many local businesses have employees that are part-time faculty on campus and they provide invaluable feedback especially in technology programs. Also, all of the School of Technology faculty have industrial experience and most from the Columbus area. Most students in the CPT program work in the Columbus area and plan to stay in the area. With the AS degree being the available degree in CPT in Columbus, it is our hope at the Columbus campus to make students as marketable in the community as possible. That is where the informal network with the community is used to find the needs of the community. This is also where the difficulty arises. One goal is to maintain the same curriculum as the main campus, and sometimes contradicting this goal is the desire to work with the local community to provide technologists trained in areas of need.

The Columbus campus has attempted to keep the integrity of the Purdue program in CPT while working with the local community. We have been able to do this in a variety of ways. In some cases, it has meant getting permission to use a different textbook that better fits the approach used in the local community. Sometimes the problem involves the tools the curriculum uses. One recent example involved two programming courses in Computer Technology, CPT 250 and CPT 255. Students in the AS program are required to take the two classes. At the main campus, the course was taught using Delphi. In the Columbus community there was no demand for Delphi, so we were granted permission to teach the courses using Visual Basic, which had a large demand in the area.

This not only satisfied students in the program, but also may be responsible for many queries about the program after the change was advertised. In this case, the main campus followed the regional campus lead by switching to Visual Basic in the past year. Another solution that is used is to offer X99 courses, which are classes not in the curriculum. These courses are able to be offered for several semesters without being incorporated into the curriculum. In some cases these courses are incorporated into the curriculum. A recent example at the Columbus campus is the CPT 299 course, which was developed for use at the Columbus campus. This course is a database course utilizing Oracle with strong emphasis on using SQL. In the new program that is approved for the Fall of 1999 this course will be included in the curriculum as CPT 272. Another solution we have been able to incorporate at the Columbus campus with the approval of the main campus is offering courses in the bachelor program at the Columbus campus. This has allowed the Columbus campus to offer a second course in system analysis and design and a second database course. Both of these courses were able to provide education in areas that the Columbus community had a demand for. In one of the most innovative approaches, Purdue University at Columbus and West Lafayette has partnered with a local Fortune 500 company. In this program six Purdue credit courses are taught in a condensed format to employees from the company and other students from the community. It was unique because the courses taught are a combination of existing courses in the curriculum, combinations of several courses that meet the needs of the company, and new courses developed for the program. The development of the program and curriculum was a joint effort between the company's technical staff, Purdue faculty and administration from West Lafayette and Columbus campuses. The fact that the main campus participated in development and delivery was critical to the success of the program. The program has proven to be a huge success for Purdue and the local company. The company can quickly retrain (12 week period) workers in an area of need. For Purdue at Columbus, it has brought financial rewards, good publicity and the previously mentioned CPT 272 course developed for the program, which was added as a new course to the CPT curriculum.

Hardware and Software

Another issue dealing with curriculum at the regional campus involves implementation. The regional campus is supposed to offer the same courses as the main campus with the same content. This creates several problems related to technology for the regional campus. Since the CPT Department utilizes computer labs in most courses, it is important to provide similar lab configurations. Funding at regional campuses for capital equipment makes it difficult to keep equipment up to the level of the main campus. Typically, allocations are less than the main campus. Donations from private industry that help keep software and hardware state-of-the-art are harder to come by at the regional campus. The majority of PCs at the Columbus campus are far short of the typical machine at the main campus in West Lafayette. With software and hardware changing rapidly this is a constant struggle to catch up. In fact, the problem has been so acute that the Columbus campus has had to take software off machines in labs in order to add other software required for another class. The problem of keeping state-of-the-art hardware has led to compatibility problems with the main campus. Unless funding is allocated to regional campuses when curriculum changes dictate hardware and software upgrades, this problem is not likely to go away in the near future. The Columbus campus has been able to make some progress. The partnership previously mentioned with the local Fortune 500 company resulted in the donation of a new lab. However, this is a never ending struggle, one that is much more difficult at the regional campus.

CURRICULUM ISSUES IN THE 21ST CENTURY

Potential Duplication of Curriculum in Columbus

What will the next century bring in issues dealing with curriculum for the CPT program at the regional campus? A recent announcement in the state of Indiana may have an effect on the curriculum at the Columbus campus. In February 1999, Governor Frank O'Bannon recently announced a combined Ivy Tech State College and Vincennes University venture. The plan focuses on providing two-year degrees at a low cost throughout the state of Indiana. The degrees would include a liberal arts base along with technical training. The main target of this effort is adults with jobs in communities. The plan emanated from Stanley Jones, Indiana's state higher education commissioner. This would appear to be a duplication of effort in Columbus if the Columbus campus of Ivy Tech is part of the program. It certainly would be as the program ramped up over a five-year period. How will this effect the CPT program at Columbus? It could have a huge effect. The CPT program at Columbus is the largest statewide site with over 110 students in the program in 1998. CPT at Columbus is part of Purdue's School of Technology with their program, staff, and prestige of the Purdue University program, however this effort by Ivy Tech if funded will provide strong competition. Ivy Tech and Purdue at Columbus would offer programs in information technology with similar curriculum. If the legislators approve funding for the program, over $5.3 million will be dedicated to freezing tuition for six years. At the present time Ivy Tech tuition is approximately sixty percent of Purdue Columbus. With tuition frozen for six years and Purdue's tuition continuing to rise at normal levels, the tuition for the Ivy Tech-Vincennes program could easily be half the price of a Purdue degree. This will probably not have a large effect on the main campus at West Lafayette, but it could have a major effect on the CPT program which as mentioned previously attracts many of its students from the working community in the Columbus area.

Creating a "Win-Win" Situation

With a similar curriculum as Ivy Tech and tuition twice as much it will be difficult to compete. However, the curriculum may provide a way to survive the competition and even thrive. If the Columbus site could offer the Bachelor of Science in CPT, we could use the program to compete and even expand. In recent years, there has been talk of offering a bachelor's program in CPT at one of Purdue's Statewide Technology sites. The Columbus site would have several advantages and has been mentioned in informal discussions. As mentioned the Columbus campus has the largest number of CPT majors outside of the main campus and the Statewide site in Columbus is the second largest of the regional programs. Upper level courses in CPT have been offered over the past several years at the Columbus site. The joint program offered by CPT and the local Fortune 500 company produces fifteen students each time the program is offered. These students come out of the program with eighteen hours that can be applied to a Purdue University degree in CPT. Typically, between one-third and one-half of the students have an Associates Degree. These students are potential students for a BS in CPT in Columbus along with the past graduates of the program in the Columbus area. Along with these potential students, are the students who will opt for the Ivy Tech-Vincennes program. Purdue University already accepts courses from Ivy Tech. This should create a large pool of potential students for Bachelor of Science degree in CPT.
There is support in the local community for a bachelor's degree in CPT. The Columbus Education and Career Counseling Project is a project involving Columbus community leaders, supported by the administrations of Indiana University, Ivy Tech State College, and Purdue University. This group is requesting funding from the Indiana Commission for Higher Education to help underwrite costs of planning a collaborative expansion of programs offered and facilities at the Columbus municipal airport where the institutions are located. Although in the early stages, this group has a goal to serve learning needs in the region through two and four-year college degrees. With the absence of an available 4-year degree in computer technology in the area and a local need, it is almost a certainty that this group will push for a program in the Columbus area.

A Bachelor of Science in CPT in Columbus does seem like a "win win" situation for Purdue University, Ivy Tech, IUPUC, and most importantly the Columbus community. With careful planning some potential pitfalls in implementing and maintaining a curriculum at a regional campus may be avoided.

CONCLUSION

Curriculum is an area that creates challenges for the university, especially in the area of Information Systems where the quickly changing environment forces the university to constantly examine the program. At the regional campus, the challenge can be even greater. Dealing with: students with different backgrounds and goals than students from the main campus; local administration and administration from the main campus with goals that do not always match; pressure from the local community to produce marketable students the regional campus faces, all of these serve to make for a challenging environment at the regional campus. In this paper we have attempted to share some of these challenges and potential solutions along with looking into the future issues that will require faculty and staff to continue there efforts to maintain a viable curriculum at the regional campus.

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Technical Training & Support for Students

Anne Vaassen
Training Coordinator
Loras College Technology Center
Academic Computing / Network Services
Loras College
Dubuque, IA 52001
avaassen@loras.edu
(319) 588-4960

Technology is increasingly incorporated into the classroom and curriculum. More and more colleges are wiring resident halls, giving students network and Internet access, which is encouraging more and more students to bring computers on campus. This gives students the flexibility and freedom away from the traditional supported "Computer Lab", however it also raises the question, "Who and how is support provided for the increasing number of students with computers in the Resident Halls?"

Let's step back and talk a little about Loras College. Loras is Located in Dubuque, IA (population approx: 60,000) is located 1½ hours from Madison, Waterloo, Cedar Rapids, Iowa City and the Quad Cities; 3½ hours from Chicago and Des Moines. Loras is an independent, coeducational, residential, liberal arts Roman Catholic College. Enrollment: 1788 men and women from 27 states and 16 countries.

The issues faced are first to identify the students' needs. Then implement effective services that will meet those needs (all this on limited resources).

All Resident halls have been wired, offering network & Internet access to each student. More students are bringing PCs on campus.

These systems range from Windows 3.1, Windows 95, Windows 98, NT, Macintosh and some are home grown. Each of these students want to connect their system to the Loras Network and the Internet. Where do we Start?

We needed to step back and look at the situation. We found we could not work with each individual student in getting their custom systems connected. We could offer general instructions, however we were swamped with questions about their specific system setup. We were fortunate to get the resources to wire each resident hall for Internet and Network access, however somewhere along the line, we didn't get the resources to support it. I am sure this never happens to you!!!

It is necessary in any problem solving process to Identify the needs and explore options to address those needs. We needed to Develop a program that will address the issues and not only benefit the students, we needed to benefit the Faculty as well. How is this all possible with a limited budget?

When looking at the needs of the students, we not only found obvious needs of how to connect and support their personal computer on the Network and Internet, we also identified the following needs:

How to login/logout of the Network
Understanding Basic Networking Functions- Printing, Saving Files, Shared Folders...
Connecting remote students to the Internet
How to use Campus Standardized Software: Windows, Email, Internet Browser, Word Processor, Spreadsheet, Database...
How are personal computer issues going to be addressed?
Can faculty assume everyone knows how to use email, a browser or a word processor?

Overall question: Who and how is support provided for Student with the increasing number computers on campus?

How is each student going to learn how to use the Campus Standardized Network Programs? Faculty are encouraged to incorporate technology to the classroom, however the first barrier they reach is, each student has varying levels of computer literacy.

Technical Resident Assistant (TRA) Program

This program offers students supporting students on using Technology. This includes:

-Offering technical support and training for those in the resident halls.
-Offering Technology Training Sessions and support on Using Campus Technology in the Computer Labs.
-Offering faculty assistance on getting students to a basic level technology skill.
-Offering student somewhere to go when personal computer issues arise.

The program began 3 years ago. Each semester we learn from the past and continue to build a stronger program. Let's look at the key element of the program:

The (TRA) Technical Resident Assistant has a multi purpose role. Technical Resident Assistants are available not only to assist students in basic logging in and out, they also:

-Support , configure, and install network interface cards - connecting student PCs to the Loras Network & the Internet.
-Promote, document, and teach informal sessions on using technology.
-Assist / support those using Campus Technology and Personal Computers.
-Assist Help Desk on Student related issues.
-Assist Technology Center Staff on Campus wide projects.

Let's start with Configuring Student PCs for Network / Internet Access.

It is necessary to Set system minimum requirements & standardize the configuration process. This limits the variety of systems supported. Much of the technology we are using limits us to Windows95 or greater and PowerMac compatibility. This is beneficial because it eliminates DOS, Windows 3.x systems, and older Macs. Memory requirements are set. Many systems will not load Netscape, IE or other standard software without enough memory. We are fortunate, only a small fraction of our students have asked for Macintosh support. We have configured less than a dozen Macintosh systems. We have configured/supported over 500 Windows systems in the past 2^1 years. We have found it is necessary to schedule and document all work done. The TRA touches others computer all the time, thus with any technical support role, documentation is critical. All documentation on a student's system is documented in our Help Desk call tracking software (DKHELP).

We have put together a few disclaimers that inform student, the TRAs are in an aspirant roll. They are not trained professionals, they are simply students helping students, thus releasing liability, in the event of hardware failure. Every student has the option to refuse assistance if they feel the TRA is not competent. It also warns the student to backup all data prior to anyone looking at their system. We make it very clear we are not responsible for lost data due to installation/configuration of a network card, or troubleshooting a problem. We are pleased to announce we have had only two hardware failures in the past 3 years, and each one was recognized immediately and dealt with by the students. These innocents have encouraged us to tighten our policy on using disclaimers and enforcing minimum requirements. We also backup and check each system prior to installation/configuration of a network card. This gives the students a chance to say they want their system back to the way it was prior to configuration. Backups are kept for 2 to 3 months. We have had some saturations where we had to revert back to the backup, because of IRQ conflicts, slowness, and hardware failure. We use a program called GHOST to backup each student system.

We give the students the option to configure their own systems, or trouble shoot themselves. We give them all the documentation to do it, however we cannot spend hours in their room troubleshooting it after the fact. We highly recommend they bring their systems to the Technology Center for installation/configuration and troubleshooting. If a system needs to be brought in the Technology Center for additional installations, configuration fixes, we do charge the student $25 for each recurring visit (usually, we only charge if a staff member has to assist the TRAs).

To get a standard computer configured for the Internet/ Internet we charge the following to the students: $25.00 if students provides a standard network interface card (NIC) . $100 if the Technology Center provides the network interface card (NIC) , and $25.00 every time it is necessary to bring the system in for reconfiguration.

Configuration of a system:
Install and configure NIC (Network Interface Card)
Install and configure client to access the Network (Microsoft Client for NetWare Networks)
Configure TCP/IP & DHCP
Install and configure Netscape or Internet Explorer
Install Email client if users requests
Briefly instruct student how to login and use the Internet when they return to their room

Training & Support

With all this new STUFF on a student's computer, we need some type of training for the students.

Technology Training Sessions.

-Sessions are held in Computer Lab.
-Informal sessions are scheduled monthly and posted on Web Page.

-Sessions are scheduled for an hour in a Computer Lab
-Open sessions are scheduled.
-TRAs are available for one-on-one sessions.

A variety of sessions are offered, some of them include:
Logging in/out.
Understanding Windows
Understanding Network Functions - Printing, Saving Files, Shared Folders...
Using the resident hall connection to access the Internet / Network.
Publishing Web Pages
Protecting against Viruses
Presentation Tips
Using Email
How to browse the Internet
Using Campus Standardized Software.
Scanning and utilizing images.

TRAs (Support and availability)
TRAs works specific hours in the Technology Center on Monday-Friday providing weekday support to students. In addition each TRA is on call one evening per week from 6:00pm-10:00pm. This provides evening and weekend (Sunday) support. The on-call hours and phone numbers are posted in the Computer Labs and on the Resident Hall Bulletin Boards.

The Technology Classes are scheduled approximately 3 to 4 times per week. These classes are usually offered from 6:00pm-7:00pm or from Noon to 1:00pm. We post our TRA phone numbers are in computer labs and resident hall bulletin boards for emergency assistance. We also offer open lab time for students with specific questions or for those who need additional help.

Training and Hiring TRAs

-Initially 4 TRAs were hired - 2 second year, 1 Junior and 1 Senior.
-Each year, we try to hire 1st, 2nd or 3rd year students. This reduces the chance of losing everyone the same year.
-Now, the Juniors and Seniors train the new TRAs on the basic tasks.
-All TRA attend continued training once a month.

TRA Requirements

We really don't require the TRAs to have a lot of computer experience. We are most concerned in their willingness and desire to learn more about technology and help others. We have found hiring a "computer geek" is more challenging because they come in thinking they already know the ins and outs and the majority of the time, they tend to require more training . We do ask the TRAs to have a general knowledge of word processing and Windows95/98. They also need to feel comfortable speaking in front of small groups. If students apply and don't have a basic working knowledge of Windows95 or don't feel comfortable talking in front of a group of people, however they have a huge desire to learn, we hire them on a semester trial basis as a TA (Technical Assistant). These students assist the Technology Staff on projects and tasks. This gives the students exposure to technology and gives them and us some time to determine if TRA is the right job for them. This past semester, I have hired all prospective TRAs as TAs and moved them into TRAs as we both become more comfortable. It has worked out great for both of us so far.

TRAs are asked to put in 12-15 hours/week. This includes the classes they teach, the time they work in the Technology Center and ^{1} the time they are scheduled on-call (unless the time spent helping others exceeds ^{1}- it usually does not). The TRA is stipend $2,000 for 10 months, paid monthly ($200). This is August 15th - May 15th. They are paid for December, even though they only work 1 week. It averages about $6.00/hour if 14 hours are put in each available week. Each TRA keeps track of their hours, so no one exceeds 15 hours/week. It also is an indication if some are putting in less then 10 hours/week.

TRAs need to be flexible. This is advantageous to the Technology Center, other students, and the TRAs themselves. Not all weeks are busy, therefore TRAs do not always have to work 12-15 hours. Working with and for the Technology Center is great exposure, experience, and a wonderful reference for employment.

TRAs select their own evening on-call and Technology Center hours. It helps in the hiring process to offer flexibility in the position. We get more applicants because they can work Sundays and evenings. They also have the opportunity to work with the greatest employees on campus : >

Promotion of the Program

Initially we did not promote the program very well. We wanted to have time training the TRAs and getting them out helping those where feeling very frustrated. Now new students are informed of the program and benefits in a Welcome Packet sent home 3 weeks prior to school starting. We hang posters in each Computer Lab and resident hall message boards.
-Every month an Email is sent to all students reminding them of the Technology Training Sessions.
-We keep the Technology Center Web Page updated (the TRAs help to keep this updated).
-A Monthly Newsletter is sent to faculty and staff. Often we remind everyone of the program in this newsletter.
-The college newspaper (The lorian) puts an article in every semester on the progress and status of the program.

Help Desk and TRAs team up to make the program a success.

As students call the Help Desk for assistance, all unresolved student calls are escalated to TRAs instead of Technology Center Staff. The TRA Program is reducing the number of student calls to the Help Desk thus relieving some frustration students previously felt. Help Desk calls give opportunity to strengthen program.

Note: When we get students to work as a TRAs, we have been lucky to keep them from year to year until graduation. I hope we continue our track record.

It is clear the Help Desk learns from our TRAs, and TRAs learn from our Help Desk. A wonderful team!

Follow Up

If a call is escalated to a TRA, it is logged in our Call Tracking Database (DK) and we randomly send a questionnaire to verify service is satisfactory. We don't do this as often as we should, however if someone is unhappy from our service, be assured we hear about it. If we recognized a frequent and/or frustrated caller, we encourage them to attend the Technology Sessions or meet with a TRA one-on-one.

What Next

-Online questionnaire
-Additional online help & documentation (students are asking for this one) !
-Scheduled workshops or campus forums run by the TRAs
-additional compensation for those who excel

Building a Wireless Portable Laptop Computing Lab

William P. Wilson
Director of Instructional Technology and Training
300 N. Washington Street
Box 439
Gettysburg College
Gettysburg, PA 17325
wilson@gettysburg.edu
(717) 337-6933

An almost daily lament on our campus is that faculty would use technology more if it was located in their classrooms, or if they were able to easily schedule rooms that contained the technology they need (nearby, I should add). Gettysburg has these rooms on campus, but they tend to be used by faculty who regularly use the technology. There are situations, however, when faculty could occasionally use computers for each student during class time but are unable to get into our lab classrooms. Last fall the Information Resources group began to investigate a portable wireless lab to fill the gap. There is now one semester of experience to report on. This session will look at the issues that had to be dealt with such as how to transport the lab, network throughput, power considerations, scheduling, and setup time. Faculty response to this initiative will also be covered.

Gettysburg College is probably not too unusual with respect to their lab situation. We have several public labs on campus, most of them in instructional buildings. They contain 15-17 desktop computers and projection devices. These get heavy use during the day as instructional space and in the evening they support student use as open labs. As time has gone on, these labs have come under increased scheduling pressure as more courses have at least some need for this type of technology support. Preference continues to go to faculty that can demonstrate they use the computers most often (it is also true that there is a certain amount of "grandfathering" going on - if they've gotten the room before, they tend to stay there). This state of affairs has two significant impacts. First, many courses that would make infrequent use of computers and the network find it hard to schedule time in the labs. Growing from this is the second outcome that one often hears this as the reason that many faculty members have not integrated Internet or computer work into their courses.

Gettysburg has tried to hold the line on adding additional computer labs to our campus mix. Each lab we add to our campus costs in the neighborhood of $50,000 every three years, and with the number of computers the College already owns, and our hardware budget, it is just not a wise investment. It would also keep us from being able to keep faculty desktops current. Add to this the fact that nearly 80% of our students are bringing computers with them and it seems like the need for the labs, at least as public work stations, should be decreasing. This of course as many of you will attest, just doesn't mesh with what we've been observing; the labs are as busy, if not busier than they have ever been.

So during the summer of 1998 we in Instructional Technology and Training (ITT) began to think about how we might attack this problem. Any solution would have to target the largest group of disenfranchised courses, those that would like to have occasional access to a lab for class exercises or projects. A front of classroom machine and projection does not satisfy this requirement, which was the only other model we had at that point. It would have to allow for quick setup since we have only ten minutes from one class vacates a classrooms and the next one starts. Ideally it would be close to where the course usually meets. We hit on the idea of a classroom on wheels, comprised of 16 portable computers with wireless networking capability. As with many good ideas, the idea wasn't the hardest part, it was implementing it. There were many issues to work out and the following sections detail those considerations and what our solutions were.

Considerations

We in ITT want to make sure that we designed something that our faculty would find useful, would set up quickly and reliably, and that our infrastructure people would feel was supportable and up to standards. We also needed to find a device that would make moving these machines around as easy as possible, which we saw as one of major obstacles. We also had a budget to work within, and some guidelines that included having a second battery available, at least a 200Mhz processor, and 64MB of memory. It also became clear that this would be a project that would be funded over two budget years, so we were going to have to look for something that would be modular and able to extend over two years.

Process

There were four main areas of activities. First, we needed to get the best price-performance deal we could for the portables. Second, we needed to explore and learn about the whole wireless world. We needed to fins the right way to get all this equipment around campus. Finally, there was rolling it out and selling the product.

Portable selection.

The computer portable decision was a lot of comparison between what vendors had but the work was probably the easiest part of this project. Based somewhat on price and features, we went with Gateway Solo 2500s. High on the desirability list was the fact that both CD and floppy were able to reside in the portable. For the way we are set up to handle repair, we also liked Gateway's repair program. They could also guarantee that their portable dimensions would stay the same for a year, which became an important piece of information as we learned we were going to have to purchase machines over two years.

Wireless products.

When we started looking at the wireless part of this, we got strong input from our Infrastructure group that helped shape our decision. First, we were told that whatever solution we came up with it must be 802.11 compliant. Standards based products and hardware are interoperable with one another, reasonably priced (cost competition plays a big part of this) and the standards, if adhered to, are designed to make products compatible with future product enhancements. The 802.11 standard is the standard for wireless technology since 1998. We elected to select Baystack 650 Access Point which supports up to a maximum of 50 users (10 to 20 is the typical range of support). We also selected Baystack Wireless Ethernet adapters as our NIC card.

Cart work.

We looked at a number of traditional metal cabinets and constructed wood products. These were very unwieldy, too big, or not capable of storing all the pieces we had to move. When our other design issues were complete, we have 10 computers, 10 spare batteries, two wireless access points, mousepads, mice, and the wireless cards. We found that the Cases-Cases company were able to customize cases to our spec; we were able to even work carrying a projection unit into our next generation of lab. We went through several iterations with the design team at Cases-Cases until we got things configured correctly. The final design consisted of two cases, each capable of carrying eight portables, eight batteries, an access point, and mice and mousepads. We were able to add large wheels to the bottom unit that helped with the portability of the unit across campus, and we could get the foam cut to our specification to keep things tight and protected in the case. The top case contained a smaller set of wheels to allow us to split the unit if necessary. All design characteristics had the advantage of allowing us to split the lab into two equal pieces if the need ever arose. In our second round of this project, we are scaling the size of the cases so that they top out at a comfortable pushing height for nearly everyone and reducing a little weight in the process.

Program PR.

We wanted to get information about our new facility. Our monthly ITT newsletter seemed to be the ideal vehicle to start the campus discussion. We also, as a result of fortunate timing, were able to make this announcement as the faculty were getting their room requests in to the Registrar, so everyone was pretty aware of their relative ability to get time in the labs or not. As a result of our newsletter announcement we got a response from a faculty member who teaches our journalism class and they invited us to class with our portable lab and we did a demo and answered their questions. As a result, an article appeared in our campus newspaper and our PR was accomplished.

Outcomes

Technical issues.

We have been quite pleased with the performance of our system. It is not geared toward large amounts of throughput (two people trying to get streaming video at high speed would not be happy), but for standard browsing and occasional file transfer we have found that 10 users can coexist quite happily on one access point. Additional access points can be added to provide additional bandwidth. We would not recommend this for heavy a/v environments. We had one early problem with the access points. Everything was working fine in our building during testing, but when we tried in one of our academic classroom buildings we could not make a connection. After some further testing, we discovered that the problem was that in our building we have an unswitched hub and in the academic building we were using a switched hub. The access point firmware was not able to deal correctly in the latter environment. A solution was available by upgrading the firmware of all our network cards. Once this was accomplished we were fine across the board. We also use dhcp here and from time to time some of the laptops hold onto their IP address from their previous session, and we must have users run winipcfg and release and renew. We also had an early problem with the screens flickering and after 15 or 20 minutes the machine would reboot itself. This turned out to have to do with power configurations. We went into setup and turned off all power management settings. This affected power consumption, but only marginally. We still get about three hours of operation with a single battery; it beats having machines reboot themselves during class!

Operational issues. Almost immediately we had requests to use the lab in ways we had never considered. We needed quickly to develop a policy statement about how these machines would be used. The BIG issue has been getting our hands around the issue of getting the devices moved around campus. The instructors are not interested (even though it is critical for them to have the devices) and we don't feel our time should be spent wheeling the stuff around campus. The obvious answer is student employees, but this would entail a different type of employee than we have now and potentially students who wouldn't be needed on a regular basis. We also had an early inkling that we must have some way to easily rebuild system that became corrupt or were tampered with by students. We decided on burning a CD once we had the load the way we wanted it rather than trying to install software security on the machine; we wanted them to behave as close to personal machines as we could make them.

Programmatic issues.

One of the principal reasons for getting this lab in the first place was to support ITT's training effort. There were often times when we could not find a lab to train in; other times we did not want to displace students in the open labs to do our training. There were also the odd requests to do training where the course was meeting, and aside from doing a front of classroom demo we were out of luck. We have been quite pleased with how the lab has performed for us. Within five minutes we can set up and start a class. In the meantime two other programmatic uses have emerged, Residential College and Collaborative Writing. We have a Residential College aspect on campus; we have roughly nine seminar style rooms within the residence halls where classes are taught, all first year seminars. In most of these we have a TV and VCR as well as a data jack or two. Some of the faculty have done some projection in these rooms, but have never been able to provide a lab-like setting for their students. This has been one area where there has been a lot of interest in the portable lab. Another initiative that will take advantage of this lab is a collaborative writing environment that a number of our English faculty will be trying in Composition this coming fall. They need to have access to a lab setting once a week and the portables will provide this access since the traditional computer labs are already full and would probably be used more frequently by the courses that are already in there.

In summary, we are finding this an invaluable resource for our training efforts, and for extending support to some new programs on campus. Another computing unit on campus (those folks dealing with administrative computing) will be taking our first lab of 10 laptops and use it as a roving training facility. We in turn will acquire our full allotment of 16 portables for our next generation lab; this is another indicator of the level of use and interest there is for this resource on our campus. There still is a building on campus that we have difficulty accessing with our portable unit due to the lack of an elevator. The cases are heavy enough to make it less that easy to get them up the stairwells in this building. We have had some interest in using them in this building so this has caused some difficulty, although it is a difficulty beyond just this project. Would we try this experiment again? The answer to this is an unqualified yes. It has served us well and interest seems to be building. It is robust enough for most of our classroom needs, and at a cost per machine of roughly $2500.

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